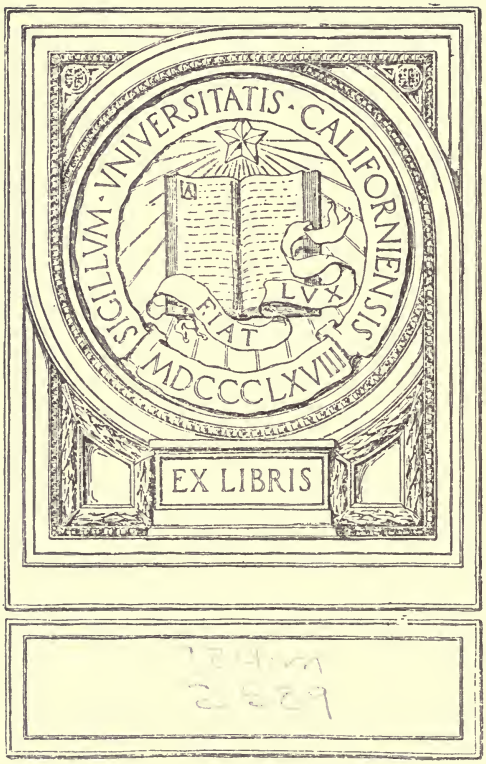
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ANTS & The Children of The Garden

by

J. Dean Simkins


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ANTS AND THE CHILDREN OF THE GARDEN

RELATING THE HABITS OF THE BLACK HARVESTER ANT

AND

GIVING CONSIDERABLE INFORMATION

ABOUT ANTS IN GENERAL

BY

J. DEAN SIMKINS

1922
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PREFACE.

A colony of Black Harvester Ants had a nest on the boundary between a bean patch and a back yard. The garden was cultivated by three boys and two girls. They became much interested in the ants and asked many questions about them.

The common prejudice against this insect soon disappears when it is understood that only a few kinds are troublesome and that ants are useful to man.

Children nine years of age and over are easily interested in this subject and desire much more information than is to be found in juvenile literature. They have abundant time and opportunity for observation—a great deal more than adults have. They are naturalists because their ancestors have been all down through the ages. Observe, investigate, question, question, question, experiment is the rule of life. The aim of this book is to aid in keeping alive these native instincts, and the little denizen of the earth, that we are to study, is a fit teacher to introduce the child of man to the world of nature.

If school classes could read something of the wonderful actions of ants and speculate on the motives that prompted the same, the back yard might become as interesting as the circus.

In the following pages, an attempt has been made to record the day-after-day life of a colony of Black Harvester Ants for a period of one year—July 1st to July 1st. Monosyllables have been largely employed for evident reasons.

The observations made are truly recorded, but the reader is welcome to his own inferences as to motives. If ants reason, it is not as we do. Ants can learn somewhat by experience—can be trained.

A number of facts are given about several common ants and considerable information about ants in general.

"The Ant" is chosen as the subject because it is found in

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all outdoors, is commonly observed by children, is the most intelligent insect, and has been an interesting object of study, speculation or observation by many people, from rustic to savant, since the beginning of recorded literature. How many hundred years since Aesop wrote the story of "The Ant and Grasshopper"? What child in any land has not heard or read the story?

J. DEAN SIMKINS.

East San Diego, California.
July 1, 1922.

ACKNOWLEDGMENTS.

The author is indebted to Dr. William Morton Wheeler of Harvard University for identification of ants, and to various authors for information on the subject of this book, among them chiefly:

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Henry McCook, author of several books on the subject.

C. W. Woodworth, Entomologist, State University of California. The illustrations of the Black Harvester Ant are largely modifications of a drawing by Dr. Woodworth.

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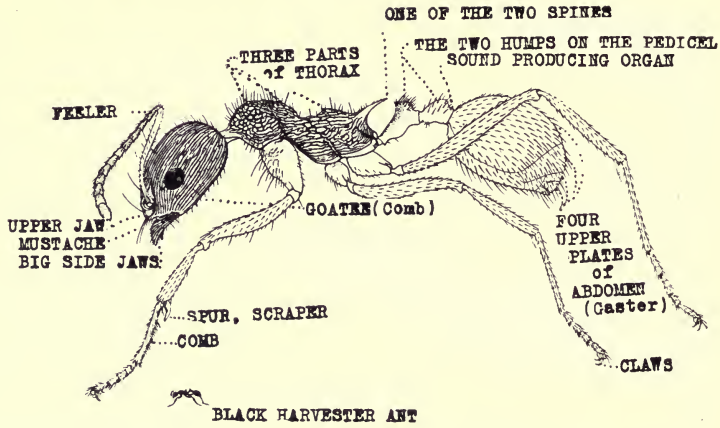
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This is the Ant that was observed by the children.
Length of worker, one-fourth inch. (Veramessor andrei) drawing, from Bulletin No. 207, State College of Agriculture, Berkeley, Calif.



THE CHILDREN OF THE GARDEN.

ANTS AND THE CHILDREN OF THE GARDEN

CHAPTER I.

July 1 to July 10.

Getting Acquainted.

*FLORENCE. Just see our ants work. They look like little camels.

A MAN (passing by). A little poison will fix 'em.

CECIL. "Fix 'em!" Who wants 'em fixed? Why, ants are worth more than bees to man. I've been reading about them and watching them, too.

The MAN. Careful there. Bees produce over 300,000 tons of honey a year for Uncle Sam.

KENNETH. I'm surprised to see this big stranger ant walking around this nest. I thought strangers were not welcome.

ALBERT. Look at this ant pulling another out of the house by the leg.

FLORENCE. I wonder how many babies they have and what they look like.

*Generally the reader will omit the names of the speakers in this dialog.

DOROTHY. Here's one carrying a stick home. Maybe that's to whip the children with. Ha, ha! Look at this ant carrying an umbrella.

FLORENCE. Cecil says ants are so smart. I'd like to see their teacher.

DOROTHY. My teacher says, "Butterflies attract others with their beautiful wings and some spiders are graceful dancers." But what can you say for ants?

CECIL. And my teacher says, "As ants are nearly blind, they may feel the beauty of face, wing, form, or motion of a fellow ant, or enjoy it through some wireless that we know nothing about. Do you suppose there is no beauty except what man can see? Were there no roses before man came on earth? What's the use of microscopic beauty?"

KENNETH. Why, I saw an ant try to do a highland fling. It stood on its hind legs, jumped up and down, sprang half an inch, and whirled round. But maybe it was just taking its physical exercise.

FLORENCE. Look at this fool ant trying to drag a squash seed home. There, five others are helping and the load moves.

ALBERT. Are these guards that are stationed around the door?

KENNETH. See this gang of harvesters coming home, each with a load of grain.

Ants Excited.

FLORENCE. If the ants are so brave, why did they all skedaddle into the house when Kenneth threw a yellow jacket down by the door?

CECIL. If you had seen Albert perform when he stirred

up a yellow jackets' nest the other day, you would know why.

FLORENCE. Why such excitement among the ants when I dropped a handful of bugs and pebbles and grasshoppers near the door?

CECIL. How would you act if a lion escaped from the show, or an earthquake shook your house down?

Ants Know Their Nest Mates.

FLORENCE. Do members of a colony know their own ants from others of the same kind?

CECIL. I find I don't know as much as I thought I did. Here's a wise-looking ant; let's ask her. How about it, Ant? Do your sisters all have names?

ANT. Certainly not, but I know all the ants that belong in our colony when I meet them, and you don't know a tenth of the people that live in your small city.

CECIL. How do you tell your many hundred ants from others of the same kind?

ANT. Mainly by the sense of smell.

CECIL. I have three strange ants in this bottle. They are like yours, but from another colony. I'll drop them near your door to see if yours know they are newcomers.

ALBERT. Look! No. 1 was carried into the house. Strange! No. 2 ran away with our ants grabbing at her, and No. 3 has lain down on her side and is being examined by six of our ants. Now one has picked her up, carried her away, and laid her down. There; she jumps up and runs away.

CECIL. Let's take two of ours down to the colony like ours.

ALBERT. See! One is allowed to walk away without

much trouble, but they pick the other up and carry her off the premises. Look at her hike out!

Ants Carry Nest Mates Around.

KENNETH. I'm afraid you are cannibals.

ANT. White ants are. We may eat the dead of another kind. But what if we are cannibals? Some tribes of men are.

CECIL. Red ants attack and even murder and eat their own kind, and I've seen yours do about the same except to eat their nest mates.

ANT. What do you mean? Are we not very peaceable?

CECIL. Yours often drag some of the family out of the house. I saw three cripple another one in forcing it out of the nest, and once I saw an ant killed in that way. Do you punish bad ants?

ANT. If a man had the smallpox, would you take him out of town as a punishment? Wouldn't you take him, whether he wanted to go or not?

KENNETH. Don't you have any doctors?

ANT. We just carry the sick ants out of the house, as you know.

ALBERT. What do you do with an ant that loses her mind?

ANT. Why ask? I say we carry our sick ants out of the house.

ALBERT. What is the easiest way to make a mad ant helpless?

ANT. Cut one of her feelers off.

ALBERT. But what if an ant refuses to work, whether she is sick or not.

ANT. A well ant can lay off work at any time and no attention is paid to her.

FLORENCE. Don't you wish you were an ant, Albert?

Other Animals Live with Ants. Food.

ALBERT. Do other animals live in the house with you?

ANT. Of course, and other animals live in the house with you, also.

ALBERT. I see so many little red spiders, or mites, in your yard. Do you want them there?

ANT. No, but we can't catch them.

FLORENCE. You're too slow for any use.

ANT. Let me see you capture that fly on your nose.

ALBERT. Why do you let so many things live in the house to annoy you?

ANT. You never have any flies and fleas at your home, I suppose.

ALBERT. You say that bugs, or beetles, live with ants. Tell us about them.

ANT. There is a single family of two hundred kinds of beetles, and each bug spends the daytime in the nest of some kind of ant. Most of these beetles have moose horns.

ALBERT. Do ants ever feed any of the bugs?

ANT. A beetle will walk up to an ant, place its mouth against the mouth of the ant, ask for food, and get it. That is one way we feed our kings, queens, babies, and hungry sisters, too.

ALBERT. Does one ant ever get food from another in any other way than by asking for it with soft strokes of the feelers?

ANT. Yes. Some ants will lick not only the head and face of another when asking for food, but even the abdo-

men. You know that some beggars understand the business better than others. Then, sometimes, ants simply steal food from others. Of course, man wouldn't do such a thing.

KENNETH. I don't quite understand how ants feed their hungry workers.

ANT. One opens its jaws, raises some food from its crop, and passes it to the mouth of the hungry one.

ALBERT. Do you ever feed animals that you don't like?

ANT. Do you feed your flies and mosquitoes because you like them? Or your rats, mice and insects that do millions of damage to crops? Or your human robbers? Yes, we feed animals we don't like, and for the same reason you do.

FLORENCE. Do your babies eat nothing but sweets?

ANT. They eat grain, insects, and liquid food. We place the babies on their backs, side by side, each in a little trough in the earth floor. Then we place the grain or torn-up insect on their flat abdomens and the babies bend their heads forward and eat off this self-made table. The babies of many harvesting ants eat the same things as do the grown-ups.

ALBERT. What are you going to do with this pile of dead insects in your yard?

ANT. You know the skeletons of bugs, sow bugs, grasshoppers and the like are on the outside of their bodies, while yours is inside. We have eaten the flesh out of some of these you mention.

ALBERT. How do you get at the inside?

ANT. We find a soft place, say at a joint, and use our scissor-like jaws to make an opening. Then we use our proboscis. Did you ever see the elephant drink water with his proboscis?

FLORENCE. But I wouldn't eat bugs.

ANT. No, you prefer snails.

DOROTHY. Why did you take that live bug back that was trying to get out of your house today?

ANT. Some kinds of ants keep beetles that they will not allow out of the house. They get something they like from the backs of the bugs in some cases, but may keep others for pets, like you do your cats, dogs, parrots, and canaries.

DOROTHY. You depend mainly on grain for a living, and so are not very good hunters for live game. Still, I saw you capture a fly and another small insect. I suppose that ants never catch the small cockroaches that live with them?

ANT. No, but they get used to them sooner than you do.

DOROTHY. I see you have carried home the bodies of cucumber bugs, beetles, earwigs, bees, grasshoppers, sow bugs, flies and worms.

Parasites.

ALBERT. Is there room on your body for another animal to live?

ANT. Plenty of it. A mite fastens itself to the body of a certain ant with its sticky feet, moves to the right place, and helps itself to food as it is passed from one ant to another, or to a baby.

FLORENCE. Do parasites ever get on the baby?

ANT. A certain baby fly wraps its long neck around that of the baby ant, leaving the heads of the two side by side. You see what will happen every time the baby ant eats. This kind of an ant baby spins a cocoon.

FLORENCE. Then what becomes of the baby fly?

ANT. It slips down to the foot of the bed, and so is included in the ant baby's cocoon.

FLORENCE. When the ant baby comes out of the cocoon full grown and runs away, what becomes of the other one?

ANT. That's easy. It comes out of the same cocoon a real fly and sails away.

Harvesting.

KENNETH. How do you thresh all this grain you carry home?

ANT. We open a seed coat at the weakest place, take out the kernel, and store it away. Then we carry the chaff out to the rubbish heap. We like such seeds as wild oats, foxtail, grass, salt grass, plaintain, filaree, fireweed, milkweed, star thistle, and all the small relatives of the dandelion.

KENNETH. You have an awful time dragging filaree seed with its long, twisted tail; star thistle with its umbrella, and wild oats with its grasshopper legs.

ANT. The chaff of such seed comes handy to close our doors with about ten o'clock in the morning when we quit work. We close the doors to keep out burglars and to regulate drafts. We keep our babies and eggs in the warm upper rooms in daytime, and in the warm lower rooms at night.

KENNETH. I notice that you open the doors about three o'clock in the afternoon, and sometimes take the chaff to the rubbish heap in relays, each ant carrying its load about one-third of the way.

ANT. Yes, but when we open the door quickly, we throw the chaff in a pile until we get time to take it away. As a rule we carry it from the room directly out to the rubbish heap. But sometimes we leave a few loads just outside to close the door with, or we may take it out and

close the door with it at once. We try to use good sense and not waste time.

CECIL. What do you do when loads are too heavy?

ANT. The same as you. Get others to help.

CECIL. I see that ants don't always agree. One may pull toward the door and another away from it. One may carry an object into the house and another bring it out.

ALBERT. Do they ever fight about it?

CECIL. Hardly ever.

ALBERT. I saw an ant carrying a pole an inch long with another ant riding on it. Then the straw was upended, but the rider still hung on.

CECIL. Neither ant may have known of the other. Often, when you think one is riding, it is walking on the ground with its hind feet and helping lift the load with the others. One often pushes a load while another pulls. Ants that seem to be working against each other often are trying to do the same thing.

KENNETH. In taking heavy loads away from the door, the ants often climb the hard, steep wall instead of passing out over the gentle slope of soft earth pellets on other sides. I think I see why—better foot hold.

Cleanliness.

ALBERT. I have noticed that each evening about two hundred of you get out on the ring of earth pellets that are piled around your door, and walk around. In this way you knock the bumps off the high places into the low and grade your yard nicely. You dump the earth into low places when you bring it out, also.

ANT. Yes, but I wish you children wouldn't muss up our grading every day.

KENNETH. Most always you clean all the rubbish off every evening, too.

ANT. We keep our house just as clean as our yard. I guess we are the most cleanly and most orderly insects in the world.

FLORENCE. How do you keep your eggs, your babies and yourselves so free from dirt?

ANT. We shampoo (lick) them and each other. We also brush ourselves and each other. Generally an ant attends to her own toilet, but dust is hard to get off. Still, we often help each other when it isn't necessary.

KENNETH. When I throw dirt on your ants, they just wipe off their feelers and then go on. Work first and clean up when they get time, eh? One day, after I had sprinkled dust on several ants, they hunted for me for fifteen minutes and then all went to work. But first one of them stood upright while three others removed the dirt.

FLORENCE. I used to think your ants were always so clean, but now when I see a shiny one in the morning I suspect she is a slacker.

ANT. Yes. Our workers often look like your men that labor in the machine shop. Dusty mining, dusty weeds, dusty trails, dusty air. Of course, we can't always be clean.

FLORENCE. How can you tell when you are clean?

ANT. We can feel dirt and smell it, too.

FLORENCE. How do you stand while cleaning up?

ANT. Often with four feet on the ground, like a dog's, or with body upright, like yours. Then we use our fore-legs much as you do your arms and hands.

FLORENCE. Sometimes you get so dusty all over you couldn't get it all off yourself. Describe just how one ant would give another a good bath.

CECIL. Let me read: "It begins on one side of the

head and goes clear round the ant, missing nothing, not even the feet and legs. The one that is getting the 'licking' limbers up its legs and holds them out; kneels down, lies on its side, and so on, as if enjoying the bath."

FLORENCE. I use tears several times a minute as an eye-wash. What do you use?

ANT. I have sponges on my forelegs. So I sponge my eyes with saliva to keep them clean.

FLORENCE. When the comb on your foreleg gets full of dirt, how is the comb cleaned? Yes, how is the whole foreleg cleaned?

ANT. With my whiskers, but sometimes with my jaws. The jaws of some ants are edged with teeth; of some others with hairs. You know that some ants have real whiskers on the under jaw, while others have tufts of hair on the under lip and bristles on the upper.

FLORENCE. What do you do with the dirt you get in your mouth when you lick eggs, babies, queens, other ants, bugs and yourself? Swallow it?

ANT. Oh, no; or we would soon be full of dirt like the fishworm. An ant has a pocket under its mouth something like the pelican has. The dirt is collected in this, rolled into a little ball, and dumped out.

FLORENCE. You shine as if you are polished today. How do you do it?

ANT. Most of the polishing is done with the tongue, and I have to get other ants to help. You have seen a cat use her tongue.

FLORENCE. Do you use stove polish?

ANT. The little oil that is in our saliva gives the best shine.

Slaves.

ALBERT. Do you keep slaves?

ANT. No, but some ants do. Some of our ants are much smaller than others, but they are not slaves. Most colonies of ants have different sizes in each family. I don't suppose all men are equal in size, even in the same family.

ALBERT. How do ants get slaves?

ANT. They steal the babies of other ants and raise them.

ALBERT. Do slaves ever try to run away?

ANT. No. They like their job. Some kinds of ants would starve without them, and some are so helpless that they have to be carried around by their slaves; they even can't feed themselves on account of their small, weak mouth-parts, such as our kings have.

ALBERT. I think the weak ants are really the slaves, then. Man better look out and not get too many servants.

ANT. As the weak ants need no workers, they have none, and are all kings or queens, of course.

ALBERT. I see the effect of slavery when carried on long enough. And with more time I think these weak colonies of kings and queens will all die off. It's best to keep on working as your colony does. But we all want to be kings or queens, don't we?

DOROTHY. Suppose you tell us about the Amazon ants.

ANT. A single ant generally gives up when attacked by several of the enemy, but not an Amazon. To fight is its whole business of life, and yet it does no work. It is washed, fed and carried by slaves.

Partnership.

CECIL. Do different kinds of ants ever go into partnership?

ANT. Yes. They live in the same house, but in different rooms, in many cases. A small kind may live with a large kind.

ALBERT. I once read something like this: "When one of the large kind comes home, a small one climbs onto its back, licks the jaws and sides of the face, and tickles the worker with its feelers until the large one is overcome with kindness and gives up a taste, mouth to mouth."

CECIL. How does the large one get pay for what it does?

ANT. Sometimes it calls on the small one and gets a free shampoo. These ants live in Texas.

Mushrooms.

ALBERT. They say some ants raise mushrooms to eat, even in California. I don't see how they do it.

ANT. "The ants carry some leaves home, chew and roll them into little balls, throw them into a room to rot, plant mushrooms and clip off little pieces of the root-like parts as food for themselves, babies and cows."

ALBERT. Do the ants carry home dead leaves or live ones?

ANT. "They climb a tree, bite circles on the tops of the leaves, take the parts in their jaws, rip them off, and either take them home or drop them on the ground for others to carry."

ALBERT. Don't the ants eat any of the leaves?

ANT. No, but after using them as fertilizer for mushroom beds, they feed them to baby beetles.

ALBERT. Do other things ever eat the mushrooms raised by ants?

ANT. Sometimes the little blind cockroaches do—the kind that lives with ants.

ALBERT. I suppose the ants are lucky enough not to be bothered with weeds in their garden?

ANT. Small workers attend the garden and pull out any plants not wanted.

ALBERT. Looks to me like ants are real farmers—make and attend hotbeds just as we do. By regulating the drafts and temperature they can have mushrooms the year round.

Eggs.

DOROTHY. I'd like to see your eggs. I don't suppose they are as large as a goose egg.

ANT. If you would lay fifty eggs side by side, they wouldn't reach an inch—even the eggs of the largest ant.

DOROTHY. If they are so small, I don't see how you move them from place to place.

ANT. We lick them, stick several together, and thus carry a number at a time.

Babies.

FLORENCE. I saw two of your babies today. They looked like worms to me, or like a tiny crook-necked squash, or like a poke. What do you call them?

ANT. A baby ant has a pretty name, "Larva." But some call it a grub, worm, baby or maggot.

DOROTHY. Do different ants all feed their babies the same way?

ANT. No. Some feed them from mouth to mouth;

others make them eat solid food off a table made of their own bodies, and some feed both ways. But the first babies of a new colony must be fed liquid food from the mouth of the queen, as she has no other kind to give them.

DOROTHY. How does the baby get rid of its tough skin?

ANT. Sheds it, and the old poke goes to the bottom if the baby spins a cocoon.

DOROTHY. Then the babies of some kinds of ants spin cocoons around themselves? I don't see how they can.

ANT. "The nurses bury the baby in soft earth. It wriggles around until it is in a little cell. Then it lines the wall with silken thread and finishes the cocoon from the inside."

DOROTHY. I didn't know a baby could work.

ANT. Oh, yes. Some babies use their cocoon silk to bind leaves together with, to make a home for the colony.

DOROTHY. Are your babies much bother?

ANT. The ventilation, temperature and moisture are always changing in the nest, so we have to keep the babies, other children and the eggs on the move like a shuttle.

DOROTHY. I have seen you carry out the dead bodies of half a dozen babies a distance of six to twenty feet. What's the idea?

ANT. What would you expect us to do with them?

DOROTHY. Would I find babies at your house just once a year?

ANT. You would find them at any time in southern California except a very few months in winter, and you might find a few even then.

DOROTHY. Then I'd think you'd get the old ones and the new ones all mixed up.

ANT. The nurses assort the babies and eggs, and place

them in piles. Different ages require different temperatures.

DOROTHY. I suppose the old ants act as nurses.

ANT. Until their bodies are hardened enough for regular work, young ants often attend the babies. They also carry or guard the babies on the trail when the family is moving. The smallest ants of a colony often act as nurses, too.

DOROTHY. I want to see you when you move. When that happens I want to see the parade of kings, queens, workers, young ants, children, babies, eggs, seed carriers—yes, and your menagerie, too. You'll look like a trail of "Forty-niners."

FLORENCE. They say the babies of some ants are covered with hair. Of what use is it?

ANT. Hairs are often used to keep the babies warm; to keep hungry ones from eating their sisters; to keep the bodies from touching the ground; to stick a number of babies together when an ant wants to carry several at a time; to hang the babies up on the wall with when the hairs are hooked at the end; to help get the young out of the cocoon by moving back and forth. Oh, I don't know what all that the hairs are used for.

Pupae.

DOROTHY. At first the baby is a big eater and then it quits to grow legs and feelers. What's its name after it's too old to be called a baby?

ANT. It is called a "pupa." I've heard people call a cocoon an egg, but it isn't.

FLORENCE. How can legs, feelers and wings (of kings and queens) grow if the pupa doesn't eat anything?

ANT. The baby (larva) eats enough for itself and also

enough to last the pupa until it's changed to an ant. The pupae of some ants are not in cocoons. I see you children wear cocoons.

DOROTHY. Not much. These are clothes. Don't you suppose we eat?

ANT. You two little queens have no wings, I think.

ALBERT. Not yet.

DOROTHY. You know the larva is buried in dirt when it spins its cocoon. Is the cocoon left buried?

ANT. No. The nurses take it out, brush it off, and take it where they want it.

DOROTHY. You spoke of ants stealing babies and pupae. Small ants couldn't hurt the pupa of a large one if it be wrapped in a cocoon, could they?

ANT. Oh, yes, they could. A lot of them would get on the cocoon, bite holes in it, rip it open, tear up the pupa and carry the pieces home. If the pupa had no cocoon, they would drag the young one to their nest.

CHAPTER II.

July 10 to July 16.

Florence and the Ant.

FLORENCE. Say, Ant, what are you good for?

ANT. What about you? You plow up our homes for bean patches, cave in our ceilings, and bother us. One evening 700 of us had to quit work and go home on account of your big feet. You don't look where you step even if you have good eyes. You act as if everything belongs to you.

FLORENCE. Well, the earth is ours. We have to have it to make a living on, there are so many of us. We have society, government, and help one another—even other animals.

ANT. We were here millions of years before you were, and more ants can be found in one county than people in your whole nation. We, too, have society, government, help one another and even other animals.

FLORENCE. Don't we bring you sugar, flies, cactus apple and seeds nearly every day?

ANT. Yes, but that is because you are a spy.

FLORENCE. That's a pretty hard name.

ANT. Think of the weed seed we carry from your bean patch. And then we plow up the hard ground, mix up the soil, let in air and water and fertilizer to make the soil ready to raise your beans.

FLORENCE: I don't believe there is a single colony of any kind of ant living in that bean patch or plowing it.

ANT. No, but there were many there for thousands of years before you plowed it.

FLORENCE. The books say it was earthworms that swallowed the surface of the earth many times and got it ready for man.

ANT. Yes, earthworms get all the credit, but we do more than they do in a dry country like this to enrich the soil.

FLORENCE. But we can do so many things that you can't do.

ANT. We can take a baby and make either a beautiful winged queen of it or a wingless, sturdy worker.

FLORENCE. I guess that's so, even if I have heard it denied.

ANT. We can track an ant either by acid or foot. Can you track a man across a grassy field? Why, I could name a score of things I can do that you can't.

FLORENCE. Smarty! You are very stupid when alone. You have to think in gangs or not at all. Your brain is not as large as the fourth part of a small pinhead, so what can be expected?

ANT. If you could do in proportion to the size of your brain, you'd be some animal.

FLORENCE. Say, Ant, let's make up. Maybe there's room on earth for both of us.

ANT. All right; shake.

FLORENCE. I kind o' like you because you're never discouraged.

ANT. And it's a good thing it's so. Man's plow is worse than an earthquake and sometimes he digs up our nests or poisons ants on purpose whether they do him any harm or not. Then think of the rain, the drouth, the wind, the ant-eaters, and, worst of all, the robber ants.

Ants Keep Cows.

KENNETH. Ants do so many funny things—even keep cows. I wonder how they get them and if you have any.

ANT. We don't keep cows (plant lice), but you'll find ants around here that do. Some keep the cows in their ant homes.

KENNETH. Go on and tell us where they get them.

ANT. The ants steal the eggs and take them home and hatch them; or, they carry the queen plant louse home and let her lay eggs there. Others steal the baby cows and raise them. But you'll find that the ants around here simply climb a tree and milk the cows where they pasture.

KENNETH. We must try to find these ants and go with them to milk.

ANT. Some ants kill the old cows before taking the young ones home.

KENNETH. What is the most common insect used as cows?

ANT. Don't you know the small, greenish or brownish louse that gets on the plants in your yard? Sometimes it is called the aphis or aphid. But certain other insects may also be used as cows.

KENNETH. What other?

ANT. In India the ants fence in the Brown Bug or Blue Caterpillar and use it for a cow. Most anywhere jumping plant lice and plant scales may also be so used.

KENNETH. How are cows fed that are taken down into the dark nest?

ANT. Sometimes on the root-like parts of tiny mushrooms that ants raise in the nest for that purpose, and sometimes on the root juices of other plants.

Crossing Streams, Driver Ants, Forming Clusters, Honey Ants.

ALBERT. I heard that some kinds of ants can cross streams.

CECIL. Let me read how it's done: "The ants cling to one another from the branch of a tree over water. They extend this ant chain until the lower end is in the stream and carried to the opposite shore by the current of water or wind. Then the ants by the thousand cross the bridge."

ALBERT. Huh!

CECIL. And that isn't all. "Sometimes the several thicknesses of ants will open up, making a tubular bridge through which the vast number of ants pass."

ALBERT: Is it true that the Driver ants of Africa chase large animals?

CECIL. In their raids, these ants drive every living land animal before them, including the black natives. Of course, flying insects escape, but birds follow to capture them.

ANT. Look out and you'll find some ants (Ecitons) around here that are as bad as the Drivers.

ALBERT. How about some of the ants of Africa and South America hanging in clusters like bees?

CECIL. Some of these clusters are a yard through, and have regular tunnels leading to the center.

ALBERT. I read that in Borneo a certain ant bites the limb of a tree and plants a seed in the wound. After the seed grows into a round bump, the ants drill holes in it for their nest. In protecting themselves from enemies, they protect the tree from the same.

CECIL. That's like the red three-inch balls on this oak bush. An insect punches a hole in the limb, leaves her eggs in the wound, and an oak ball grows and becomes the

home of the new family. Look at this old ball. You can see the hole through which the new family escaped.

KENNETH. A boy at school told me he found a family of ants living in one of these old oak balls.

ALBERT. Some kinds of ants live in the thorns of certain acacia trees. The plant pays the ants for defending the tree with honey found at the base of each leaf.

CECIL. Yes, and this is the same ant that sends its soldiers down to the foot of the tree to keep away enemy ants that want to cut the leaves off. I suppose the tree is glad to have one kind of ant protect it from the other kind.

Honey Ants.

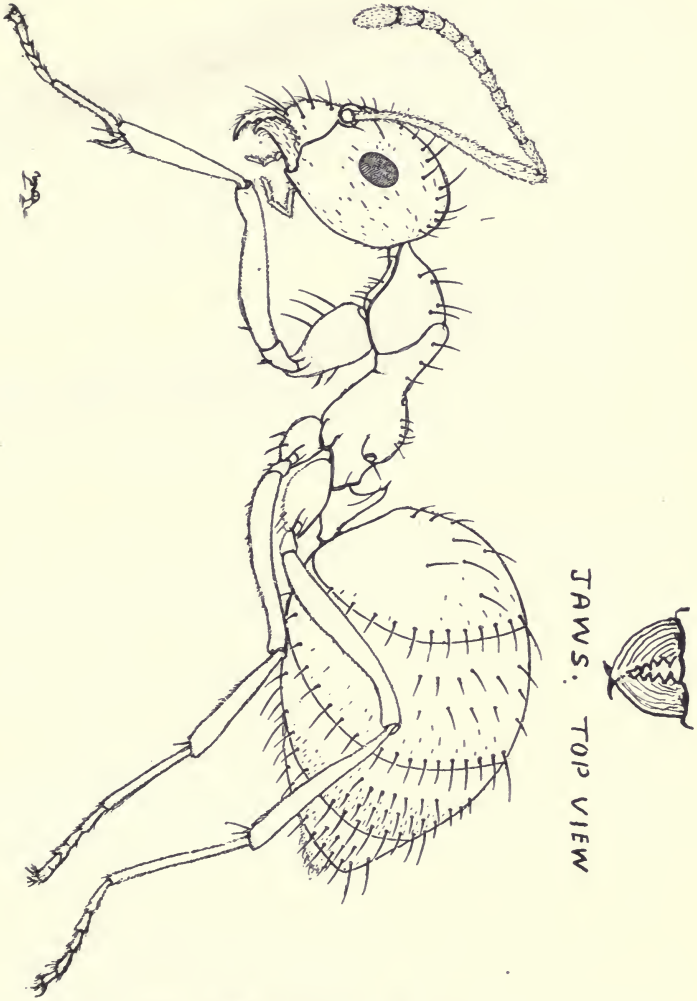
ALBERT. Is it true that certain ants over in Arizona hang up some of their family to the ceiling—sometimes as many as three hundred—and use them as honey-pots?

ANT. Yes, and a honey-pot ant looks like a grain of wheat attached to a big cherry. The cherry is the pot (abdomen). The rest of the ant is the grain of wheat. The ant holds onto the ceiling with its claws. When it happens to fall down and tries to walk, its feet doesn't touch the ground half the time, and it has to be helped back to the ceiling.

ALBERT. How do the other ants fill the pot?

ANT. They get some honey drops from the skin of oak galls, put it into the mouth of the honey-pot ant, and she swallows it and stores it away in her craw. Then she feeds it to other hungry ants. The Indians dig up the nests and break the jars when they want to get the honey. The natives of Brazil and Central Africa think that ants themselves make very good eating.

ALBERT. I guess our Bean Gang better start a honey-pot farm.



HONEY ANT. Myrmecocystus Melliger var. Lomaensis. Notice Abdomen. Named after Point Loma.

CECIL. I can tell you and Ant, too, that there are three colonies of this honey-ant (Myrmecocystus melliger Wesm. subsp. lomaensis Wheeler) within one block of us now, and one of these is not a hundred feet away. Contrary to the rule, this ant works through the heat of the day. It has good eyesight, and, when I first found it, was wild, swift and hard to catch. Mr. Wheeler called this subspecies lomaensis because some specimens were sent him from our Point Loma.

FLORENCE. I found one of their nests. Part of the dirt they carry out is from the hardpan. They want a good solid roof to hang their honey-jars on. I found a big pile of insect skeletons under a weed near the nest. This ant is black and nearly as large as ours.

ALBERT. How long may a honey-pot hang to the ceiling?

ANT. For months and perhaps years. Maybe you know some people that would like such a job.

ALBERT. Why do you think this ant has such good eyesight?

CECIL. Because when I come in sight the miners often quit work, and the food carriers hide or run up weeds, and remain still for a time. But they are getting tamer.

FLORENCE. They work through the hottest part of the day, as you said—from 9 a. m. to 5 p. m. They search for food on the cement sidewalk when it is so hot I can't hold my hand on it.

CECIL. They begin work in the morning, about the time our harvesters quit, and stop in the evening about the time the harvesters begin. In the suburbs of San Diego, during the hottest part of the day, you are likely to find one or more on the sidewalk in nearly any block.

ALBERT. You wouldn't be likely to find any other ant at such a place when it is so hot.

FLORENCE. They hunt for plant secretions and for dead insects as far as a hundred and twenty-five feet from home. A week after I gave them a large sow bug the skeleton lay in the rubbish heap.

CECIL. I dropped a half-inch beetle at the door. A worker gave it a shot and paralyzed it. I then laid the bug on the window sill, and it didn't come to for five hours.

KENNETH. These ants don't often bring any seeds home, but once in a while they carry star thistle into the nest.

CECIL. I now remember that a hundred or more honey ants like to loaf around on their yard after a shower, while it is still drizzling. The kings and queens often do the same. Their queens are quite large.

KENNETH. In continuous light rains these ants walk over their yard all night. But at such times they are very sluggish. You can easily pick them up without seeming to disturb them. They are not sensitive to danger—don't seem to know it when you pick up their queens at such times.

ALBERT. How different they then act from what they do when at work at their usual time for labor—through the hottest part of the day. I've never seen it too hot for them to forage. The hotter it is the faster they go and the more sensitive they are.

Play.

KENNETH. Do ants play?

ANT. They are not supposed to know enough to do that.

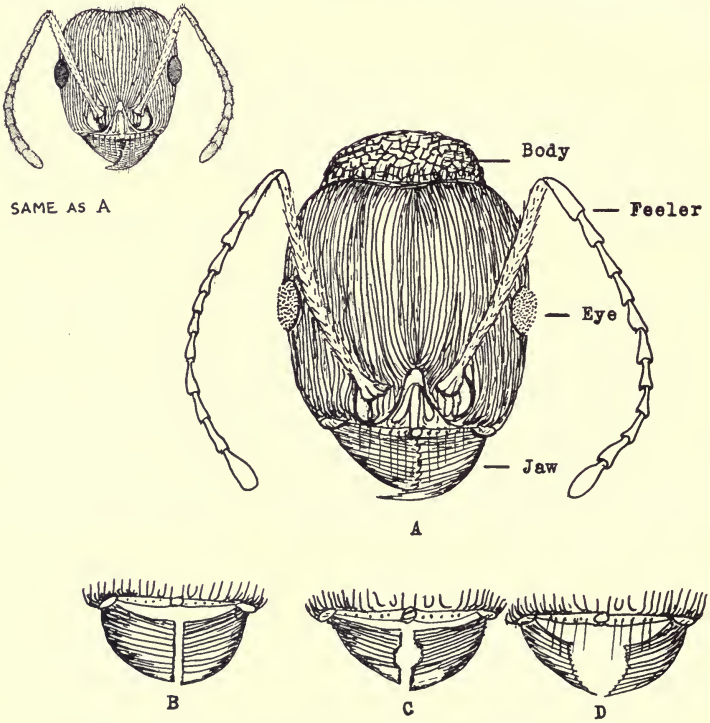
DOROTHY. Why, I read of queens that played with their servants at times like a cat with her kittens—throw-

ing them onto their backs and hugging and kissing them.

ALBERT. Sometimes an ant looks like it is toting another round for fun.

CECIL. Two hundred ants often loaf around on the yard of an evening, and sometimes a practical joker sounds a false alarm or something to frighten the timid ones. Looks like play to me. I've seen a rooster perform this same trick.

Head, Jaws and Teeth of Black Harvester.



A and D—Jaws of young worker and also of queen.
B—Jaws showing smooth worn edges of miner.
C—Jaws showing curved worn edges of seed-carrier and miner.

CECIL. The head of one of our ants is about the size of a small pinhead—the longest diameters being about one-sixteenth of an inch. The head of the big ant that visits ours is about twice that long and of the small ones that are so common, only half as long as that of one of ours. Nearly all ants have fierce-looking jaws.

ALBERT. I see you use your big jaws as scissors to cut with, as a comb to clean your front legs with, as picks in mining a cave for a home, as trowels in making earth pellets, and as shovels and baskets in moving earth.

ANT. Yes, and I use them in capturing game for food, in holding food while I eat it, in feeding others, in husking seed, and sometimes in building walls.

CECIL. Your jaws are also used in carrying rubbish, skeletons, and sick and crippled ants out of the house and in carrying eggs, babies, queens and tired ants. They seem to be your chief weapon of warfare, also. Why, you couldn't get along without jaws any better than I could without hands and arms.

ANT. No. You have legs and arms, and I have legs and jaws, and we get along about the same. Arms and jaws are each many tools in one.

DOROTHY. Don't you chew with your big jaws?

ANT. Why, no. If your hands were on your head, you wouldn't chew with them, would you? They wouldn't be in your mouth, would they?

DOROTHY. Well, I think your jaws might be called one of your mouth parts. I must take my glass sometime, and find out if I can see your real mouth.

ANT. It is under my big jaws. I can draw it back or push it out. It has another pair of weak flat jaws at the sides to help handle the food, and two more pairs of little feelers. My upper lip is long and bends down over my lower one, when my mouth is shut.

FLORENCE. I wish the camel had a long upper lip like that. Then it wouldn't look so sad. You know, I think you look like a camel.

ANT. My mouth would get full of dust and sticks if it were not for my overlapping lip, my big jaws, and if I couldn't draw my mouth back. I can push my pharynx out and shove the lid off my mouth with it.

FLORENCE. Your "pharynx"? What's that?

ANT. My lower lip is on the floor of my mouth and my tongue is on that lip. The food passes back into the pharynx as I am about to swallow, just as yours does.

DOROTHY. You know a lot for an ant.

ANT. With the sides of my mouth parts I can scrape and cut hard food, such as seed kernels. With my tongue I can lick and lap liquids, and scrape with its rough edges.

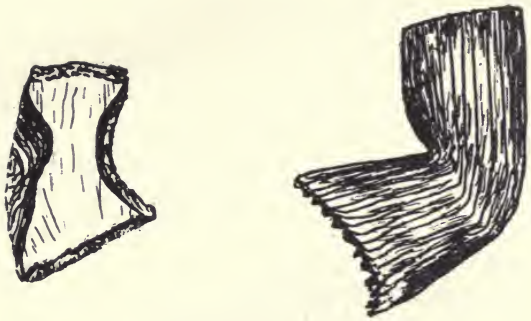
DOROTHY. Must be something like my cat's tongue or our cow's.

ANT. I can arrange my mouth parts into a tube through which I can suck. My upper lip is split so I can use the parts as fingers. My mouth has several other handy parts, also. In fact, it's a great deal handier mouth than yours.

FLORENCE. Oh, I don't know.

KENNETH. Tell us more about your jaws and teeth.

ANT. Each jaw has a long, hard cutting edge and the jaws work like scissors. Ours have teeth and also bristles along the edges before they are worn off in mining and carrying seed.



Outside of a Jaw.
Basket-like Inside of Jaw—Teeth worn off.

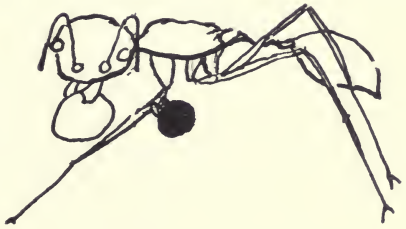
FLORENCE. Why are your jaws hollowed out like a scoop?

ANT. So I can use them as baskets in carrying out dirt when it is not damp enough to make into balls.

FLORENCE. I'd think you would smash your eggs and babies carrying them in your stout jaws.

ANT. I can carry a bunch of babies as safely as you can carry one baby or as gently as a cat carries a kitten.

KENNETH. It's queer how the jaws will get set and hold onto an enemy, even after the ant's head is cut off. I have seen ants at work with a "dead head" hanging to a leg. I pried one loose for an ant.



Ant working with "dead-head" clasped on leg.

ALBERT. I suppose the ant would have injured her leg if she had pulled the head loose—broken the leg.

CECIL. I read that in South America "native doctors will close a wound, let the big jaws of soldier ants clasp the edges of it, and then cut their heads off. The jaws still hold the edges of the wound as if sewed together."

FLORENCE. Well, I examined your mouth through a glass today. It looked like a round hole in the bottom of your skull. You had drawn it back. I see now why you don't get jabbed in the mouth when running through tangled weeds.

ANT. Uh-hu!

FLORENCE. You must be a blind bonehead. You are always butting into something, and yet never crack your skull. I doubt if another animal could digest it.

ANT. My skull is hard and thick, and in waves or folds. That kind of a sphere is hard to crush. But I don't bump into something as often as you think I do. I can stop quickly after a feeler touches an object.

CECIL. A certain ant can snap its jaws together against some hard object and throw itself as far as eighteen inches. In this way it dodges its enemies. Maybe you don't know that some ants can leap from twig to twig a distance of several feet. I don't believe any ant can dodge sidewise.

FLORENCE. I don't think our ants could dodge anything. Why do they work their jaws so slowly, even in a fight?

ALBERT. Suppose my arms were razors, worked like scissors, and that I was blind. I guess I better not use them carelessly in a crowd, especially if my muscles were many times stronger than they are. I might behead some of my friends or cut their legs off. But we've yet to learn why the speed varies.

FLORENCE. I see. The ants must have poise, as our teacher says.

Feelers.

DOROTHY. How about your feelers?

ANT. Oh, our feelers are such wonderful organs and used for so many purposes that nobody knows all about them. Of course, we have other organs of sight, sound, smell, taste and feeling. Our feelers, though, can do the work of these better, and a lot of things besides.

DOROTHY. Then how are we to know anything about the "lot of things"?

ANT. You can't. I guess man has special senses he hasn't discovered yet or else he has forgotten about them. Then why be surprised at ours?

DOROTHY. My hand and arm together are a little like your feeler. You and I each have an elbow in our feelers and we each cross feelers when we meet our friends, don't we? We call it shaking hands.

ALBERT. What if you should lose a feeler?

ANT. It would be the same for me as removing the front part of your brain would be for you. If I should lose my feelers, I couldn't find my way; I wouldn't know our own ants or my home, and I couldn't hunt food, or attend the babies, or do anything.

ALBERT. Our teacher says that a great man by the name of Darwin said that the brain of an ant is the most wonderful particle of matter in the world.

ANT. I guess he meant to include the feelers. An insect's feeler and a bat's wing are the most sensitive organs in nature. The bat's brain is spread out over its wings and the insect's over its feelers.

ALBERT. Why do you keep your feelers on the move all the time?

ANT. Why do you hold your hands out and move them when you are walking through the brush in the dark? Besides, our feelers give us much more information than your hands give you.

ALBERT. If different kinds of ants should conclude to go into partnership and live in the same nest, would they cross feelers when they meet each other?

ANT. Yes, but not unless they were in partnership.

ALBERT. I have several joints in the outer half of my feeler, counting my hand and wrist.

ANT. I have eleven joints in the outer half of my feeler, but only one in the other half—a good deal like yours.

ALBERT. How do you hide your feelers—how fix them to keep them from being bitten off?

ANT. I fold them at the elbow and lay them up and down close against my head. I fix them that way when I talk to strange ants and bugs.

How Ants Got Scattered Over the World.

CECIL. As ants are found nearly everywhere, I'd like to know how they get to so many places.

ANT. They float on logs; form a ball of ants and float; and ride on animals, ships and railroad trains. They also walk, but that's a slow way to travel. Queens may fly or be blown a long distance to form new colonies.

The Garden Ant.

DOROTHY. Look at these little ants. I see them around

here everywhere. Their craters are only about three or four inches across. They build nearly up to the door of our ants. What shall I call them?

ANT. Suppose you call them the Garden Ant.

CHAPTER III.

July 16 to July 24.

The Big Ant, Carpenters.

FLORENCE. I'd like to know why so many of these large ants visit ours and why so many of their dead bodies are brought home by ours.

CECIL. We'll call that the Big ant until we find out its name. When I left one of the Big ants at the door of ours today, it snapped at ours, but I guess it was only a pretense because no attention was paid to it.

KENNETH. I threw a crushed one near the door. Why did all your ants shy around it so?

ANT. A dangerous acid was set free from her body, and we smelled it.

KENNETH. About two hundred of yours were shocked or something, I hardly know what. They raised their bodies as high as they could reach and trembled all at once.

ANT. Probably some ant gave the danger signal on account of that acid and others repeated the message.

DOROTHY. Sometimes yours seem very nervous when a Big ant is killed near them and sometimes they don't. Why is this?

ANT. It depends on whether or not any odor has been set free to warn them.

DOROTHY. I left a Big ant at your door and it ran away. I brought it back and it ran into your house, but soon rushed out. I haven't found its home yet.

ANT. It hides its nest, or makes it where it will not be noticed.

FLORENCE. That ant is a giant—half an inch long, or twice your length, and four times as long as these Garden ants. It has a single hump on its back instead of a double one, as you have.

ANT. Go on.

FLORENCE. It likes sugar better than you do; is smarter than you; goes alone while out foraging, and you are not afraid of it. Its jaws are coarse saw-toothed, instead of being edged like yours.

ANT. Yes.

FLORENCE. One after another I got five of your ants on the end of a straw and shoved each into the face of the Big ant as she was eating a lump of sugar at your door. She simply moved out of the way and kept on eating. It took her half an hour to get enough.

ALBERT. I suppose everybody in town knows the Big ant, as it is found in many door yards and is often seen walking on the sidewalk.

FLORENCE. Every morning I find the bodies of six to twelve of these ants at your door. Will you explain?

ANT. Don't be too sure that we capture it alive. Watch and you will learn. We are plodding hard workers and don't look for trouble. We are slow, careful, not inclined to fight, and mind our own business. We don't try to make a living off the wits of others.

KENNETH. I counted five teeth on each jaw of the Big ant. Such jaws could capture, hold and tear an enemy and cut fruit.

ANT. Some day you will learn how they are used in house making.

KENNETH. That ant hardly ever carries anything in its jaws, but I saw one take a fly home today.

ANT. It generally gets liquid food, swallows it, and takes it home in its abdomen (craw). Some ants have a tube through each jaw or a groove along the side, through which they suck fluids.

ALBERT. Yours often carry in parts of the Big ant, but pretend not to take the whole body into the house. I'm certain you use this ant for food.

ANT. Pretend how?

ALBERT. The body is carried clear up to the door and then back a few inches and left.

ANT. We first go clear up to the door so we will know just where we are and can then leave the bodies right where we want them. Flesh moulds in our damp house and keeps better outside. Does man ever dry meat in the sun—or does he dry it in the cellar?

CECIL. Maybe you leave them outside as scarecrows, or so other animals will eat them instead of you. When I left some of them at your very door, you carried them back one to three inches.

ALBERT. I see you often touch noses with the friendly Big ant, but you both keep your feelers well laid back against your heads.

KENNETH. I carried one of these ants in a bottle and let it out by the door of a colony like our ants. A hundred of them surrounded it and wouldn't let it go. They all got into a fight. The stranger was getting the worst of it because its feelers got caught in the coil of a filaree seed.

FLORENCE. Why didn't you help the Big ant?

KENNETH. I picked it up and removed the trap. It then grabbed one of the other ants, held it a while, dropped it unharmed, and escaped.

FLORENCE. Say, Ant, please tell us the name of the Big ant.

ANT. It is Camponotus (Myrmoturba) maculatus Fabr. subsp. vicinus Mayr. Var. luteangulus Wheeler.

FLORENCE. Well, what do you think o' that! The name of a prince. No wonder it's the biggest ant in the world. Oh, I mean its everyday name.

ANT. Its common name is Carpenter Ant.

FLORENCE. It must be a regular beaver. Well, if it is a Carpenter, I suppose it builds its nest in wood. Now I'll find it. The books say that Carpenters gnaw galleries in trees with their big jaws and make their homes in them, but that sometimes they will use the vacated house of a woodworm or of something else.

ANT. They can make their house in the hardest kind of wood, but partly decayed wood is easier to chisel out.

FLORENCE. As there are no trees around here, I don't know where to look for the nest.

ANT. You'll be surprised some day that you didn't find it long ago.

ALBERT. The jaws of the Carpenter seem to be chisel, ax, pinchers and saw all combined in one tool. All right for wood as well as for other things.

ANT. As there is no wood here, don't be too sure you will find that ant's nest in trees in southern California.

FLORENCE. I thank you. You nearly forgot and told me something. I suppose that the ant is like man and can adapt itself to almost anything.

DOROTHY. It must be great to be a fine big ant like the Carpenter.

CECIL. Yes, but its large size is against it, for other animals can see it and capture it for food. No wonder it hides its nest, goes it alone, and so often loses its life.

FLORENCE. Most women don't like the Carpenter very well, for once in a while it gets into the sugar bowl.

ANT. Yes, it is learning to be a house ant and a city ant since the discovery of America. Some ants are like some men—they move to town when they should stay in the country.

ALBERT. They say this ant is easily destroyed with a little carbon disulphide solution if you can find the nest.

KENNETH. They say the Carpenters never make trails, but they do sometimes. I saw one an inch wide and many feet long. It led to a watered lawn, and was as good a trail as any ant could make, but notice the width. This ant goes single file and doesn't need a wide trail.

ALBERT. I know a Carpenter colony that is using a cement walk as a trail for sixty feet. A colony like ours is using the edge of the same walk and some small ants are playing safe by using the crease down the center.

DOROTHY. Why do so many of the Carpenters die?

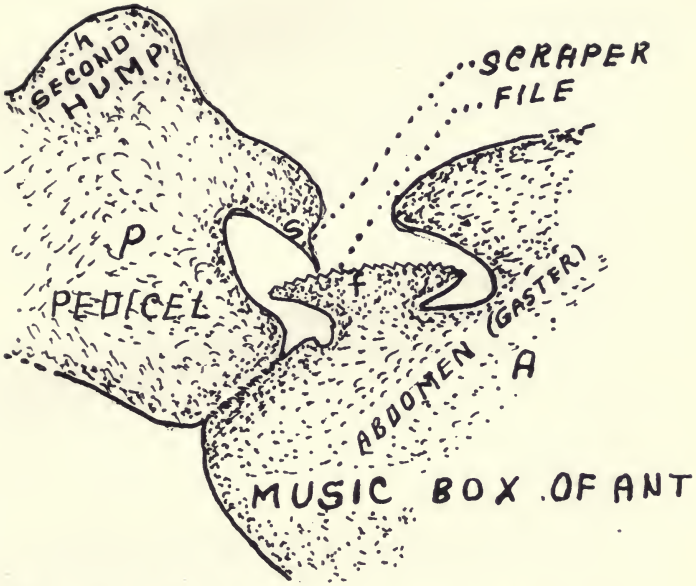
ANT. They are so large that they are easily seen, and so you just think more of them die than others. Still, 7,000 a year may die on this lot. Ants don't live forever.

ALBERT. The Carpenters have an awful time fighting bugs, bees, flies and yellow jackets to keep them away from that pile of fruit parings. The jaws are good weapons, all right.

CECIL. Yes. That ant drives these insects away just like a dog chases chickens.

ALBERT. You dragged the body of a Carpenter home. Another one followed the trail, examined the body, and then walked around among your ants.

ANT. We are on good terms with that ant. You never see us fight.



Music Box, Wind Instruments, Stringed Instruments.
See "Ants," Wheeler, p. 27.

KENNETH. One day you said an ant told another something. Tell us about your talking machine.

ANT. You see the very slim pedicel that connects my abdomen to the part the legs are on?

KENNETH. Yes, and it has two humps on it.

ANT. Well, there is a file on my abdomen (gaster) next to that pedicel. There is a sharp plate on the last hump of the pedicel and I can make that plate scrape on the file and make a noise.

KENNETH. Do all kinds of ants carry this phonograph with them?

ANT. The Carpenter has none. No ant has a better one than ours.

FLORENCE. Well, I can't find it and I can't hear it.

ANT. Maybe the note is too high for man to hear.

FLORENCE. That may be noise, but it isn't music.

ANT. But some ants that belong to our family have a coarse file and a fine one beside it. That would be as good as your ukulele.

FLORENCE. All right. Your orchestra is engaged for our commencement, some years hence.

KENNETH. When I hold an ant by the leg over some other ants, I can't see that it holloes for help. The other ants pay no attention.

ALBERT. Maybe an ant wouldn't hollo at such times. Why endanger the lives of the other ants?

FLORENCE. There is a lot of music going to waste, isn't there?

ANT. All yours is wasted so far as I'm concerned.

KENNETH. Eighteen inches from the trail I scratched on the hard ground with a small stick for ten minutes. Eighteen ants left the trail and came toward me four to nine inches, but all returned except two that hid under some weeds.

CECIL. Some think that ants can't hear at all except through the ground and their feet. As I can feel sound waves through water with my body, so an ant may feel sound waves through earth with its feet.

KENNETH. I suppose they can hear through air. I cracked two small stones together for quite a while two feet from a group of ants. In time they all became excited and five came straight to the stones. Two of the five tried to bite them, while a third got cold feet, grabbed a stick and ran.

CECIL. Maybe they heard through the ground.

KENNETH. They don't pay any attention to a tin can when I hammer it near the nest.

FLORENCE. Why don't you have some kind of a horn or wind instrument?

ANT. Something like a man's nose, for instance? Well, I have. A number of little breathing pores on my body do the trick. A little plate over the entrance of each pore vibrates and makes a noise when I force breath over it. See?

CECIL. There are about twenty of the pores (spiracles) —some on the abdomen and some on the body near the legs.

FLORENCE. After the wings of a fly have been removed I can still hear it buzz, but I can't hear you.

ANT. You could if there were enough of us together. Why, you can hear a queen buzz several inches away.

FLORENCE. All of you ought to have wings and then you could stand in your door and buzz and make a draft to ventilate your house like bees and winged ants do. I suppose your buzzers aren't as good a talking machine as your phonograph. What else you got?

ANT. Some ants have eight pairs of stringed instruments. We have more than that, besides a pair in each feeler, but man isn't certain that they are for making sound, and I won't tell. Man doesn't know what the little umbrella-shaped bodies in the pits on our jaws and joints are for, either.

CECIL. Maybe these are parts of your wireless outfit. An ant's stringed instrument might feel a sound and act as a sense of touch. Seeing is by sense of touch, anyway. The waves do the touching.

FLORENCE. Listen at that grasshopper fiddling. He is drawing the file on his thigh across his wings. Sounds kind o' nice.

CECIL. Yes, and look at this ant sliding the plates of

its abdomen back and forth on each other, as if breathing. These plates have files on the overlapping edges and so the ant, too, may be fiddling—or is it just running that phonograph? Just think of all the talking machines our ants have!

FLORENCE. See if you can make a noise by stamping your foot on the ground. Ha, ha, ha!

ANT. You needn't laugh. Some colonies can make a noise like a rattlesnake makes by butting their heads against the walls of their house or by striking the walls with their abdomens. They butt for the same reason a rattler rattles, too.

Parts of an Ant. Craw, Gizzard, Hair.

CECIL. I can't make out the parts of an ant.

ANT. You surely know the legs, feelers and head. The large back part of an ant is called the abdomen, and you know that, too. The part the legs are on is called the thorax, and the little tube that connects the thorax and abdomen is called the pedicel.

CECIL. Is the pedicel a part of the abdomen?

ANT. Yes, and its two parts plus the four plates on top of the abdomen make six in all for our kind of ant. Even the back part of the thorax is really a part of the abdomen.

CECIL. I can see three plates, or parts, to your thorax, too.

ANT. The two long, sharp spines at the back part of the thorax protect the pedicel from the bite of enemies.

FLORENCE. You have two humps on your pedicel, but the Carpenter has only one. Come to think of it, there are single humped and double humped camels.

ANT. Hem!

FLORENCE. I have read that the camel stores food and fat in its humps. What are yours for?

ANT. You'll have to guess.

FLORENCE. I see that you have two toes on each foot, the same as the camel has.

ANT. The two sharp claws are for digging, scratching, and for holding onto rough walls.

FLORENCE. But a fly can beat you. It can walk up glass, for it has something sticky on its feet.

ANT. I also have an oily substance between my claws and can walk up glass.

FLORENCE. A camel can go a long time without water.

ANT. But not nearly so long as I can.

KENNETH. When you rasp food off a hard seed or off dried meat I don't see how you can swallow it. It wouldn't go through the slim pedicel.

ANT. I don't swallow it. No ant swallows solid food. I put the flour or meat into that little dust pocket under the base of my tongue, dampen it, take out the part I need, swallow the liquid food, and dump the solid part out.

DOROTHY. A good deal like I press the juice out of fruit in my mouth when I don't want to swallow the solid part.

FLORENCE. One day Kenneth spoke of your craw. Ha, ha, ha! An ant has a craw! Like a chicken's, I suppose?

ANT. Yes, somewhat. But an ant's craw is a sack for holding liquid food. This food can be passed on from the craw into the stomach or pumped back to the mouth to feed babies, queens, hungry ants, pets or other guests.

FLORENCE. An ant must have a first-class stomach pump (gizzard).

ANT. She has. It pumps the food into the craw and then pumps it from the craw into the stomach; or, as some think, back to the mouth to feed others.

CECIL. I see. The large abdomen is the storehouse for liquid food that may be drawn on for months if other foods be scarce, or it may be the only way to carry liquid food home to the family, as the Carpenter has to do.

ANT. That ant couldn't store her liquid food in a granary, like we do seeds, of course.

ALBERT. How can you raise your abdomen with those two sharp spines pointing back toward it?

ANT. The spines are far enough apart to let the pedicel slip up between them.

FLORENCE. I'm surprised at the number of hairs when I look at you through the glass.

ANT. You have hairs all over you, too, except the bottom of your feet, the palm of your hands, and the last joint of your fingers and toes. As I have told you, some of our hairs are changed into organs that have many uses—many that man can never understand. Touch some hairs on the back of your hand and see if you can understand how we use them as organs of touch. Do the hairs ever tell you when a fly is walking on your arm?

FLORENCE. Go on.

ANT. Our hairs are coarse and long on the body, shorter and more of them on the legs, and very short and still more of them on the feelers. Some of them don't look like hairs.

DOROTHY. I notice that miners wear theirs off—against weeds and the walls of the house, I suppose.

ANT. Hairs are movable at the base and have nerves entering them.

Eyes.

FLORENCE. You have big eyes, but if you can't see with them they are all a sham.

KENNETH. Maybe an ant's eyes gather up enough light so it can see a little even in its dark house or at night. Ants might see where we are blind. Many animals can see in the dark.

ALBERT. You have big eyes on either side of your head and are supposed to have three small ones on top of your head, but I can't find them.

ANT. Our workers have none on top, but our kings and queens have.

FLORENCE. What are the names of your different kinds of eyes?

ANT. All our kind of ants have a big lateral eye on each side of the head, and our kings have three good medial eyes on top of the head, besides they have lateral eyes. The queens have lateral eyes, but two of the medial eyes are poor. Workers have no medial eyes. Medial eyes are supposed to see short distances.

CECIL. The king, the gentleman of the family, has wonderful eyesight, and I suppose can see queens and other kings as they sail swiftly through the air at flying time. My eyes would be no good for him.

ALBERT. How do blind ants see each other in the air?

FLORENCE. You have big eyes, but can't see much. You are going entirely blind because you have taken to living in a cave and to working all night. Have some ants no eyes at all?

ANT. You'll find some around here that have none. Some ants never come above ground except at flying time.

Of course, many of these are eyeless, like some of the insects in Mammoth Cave.

CECIL. You must remember that many animals can see light with certain cells of the skin—earthworms and several animals of the sea, for instance.

How to Tell an Ant from Another Insect.

ALBERT. How can I tell an ant from another insect. Some that look like ants are not.

ANT. Notice the slim pedicel that connects the two large parts of an ant's body. An ant can fold its body at the joints of this pedicel and double its abdomen under its body or over its back, or whirl it round and round. The pedicel of an ant has one or two humps or scales on it.

The Name of Our Ant. A Letter from Mr. Wheeler.

FLORENCE. Say, Ant, you gave us the name of the big Carpenter; give us yours.

ANT. My new name is Veramessor andrei Mayer, but my old name is Stenamma andrei Emery.

FLORENCE. There you go again. I don't care anything about your old name or your new name. What I want is your handy name.

ANT. You may call me the Black Harvester Ant, but there are other Black Harvesters—one near here is shiny black.

FLORENCE. I wonder in what parts of the world our ants live?

CECIL. Many about like ours live in different parts of the earth, but our particular kind lives in this part of the United States and over the line in Mexico.

FLORENCE. What are you reading, Albert?

ALBERT. As president of the Bean Gang, I have received this letter in answer to ours to Mr. Wheeler:

Dear Children:

I have identified the ant you are studying as Veramessor andrei Mayer. I would say that Veramessor is simply a synonym of Messor and Stenamma. Originally all these ants were placed in the genus Stenamma by Emery, and later he and Forel called some of the California species Messors, thus placing them in a genus which is common in the Mediterranean region. Later it was found that the wing venation of the California forms is different from that of the Mediterranean Messors, so Forel suggested the genus Veramessor for our southwestern species. There seems to be several of these, some of them occurring in Lower California. If you get over into Lower California, you might make some interesting discoveries in the species of this genus. Yours very sincerely,

W. H. WHEELER.

Forest Hills, Boston, Mass.

Mr. Wheeler says our kind of ants hasn't been studied much. I wish somebody would write a book on Ants, for children, like Dr. Wheeler has for grown people. We have more time to study ants than grown-ups have.

CECIL. We all thank Dr. Wheeler for his help, also Dr. C. W. Woodworth of the University of California for his Bulletin No. 207, College of Agriculture, and Dr. Henry McCook for his interesting books on Ants.

FLORENCE. Well, I'm now acquainted with a real carpenter and a real farmer—I mean harvester. I guess they are both well named. I never saw other such harvesters as ours are.

Kenneth's Experiment.

DOROTHY. What on earth have you in that half-pint bottle, Kenneth?

KENNETH. Three of our ants; six of our kind, but from another colony; four Carpenters; one live fly; one dead fly—fifteen in all. I want to see who'll get the fly.

ANT. They are in prison and will not act as if free.

KENNETH. I'll make them act some way for I've dropped a bee into the bottle. One of the Carpenters is carrying the dead fly around.

ALBERT. Look! The four Carpenters have tackled the bee, and one of them has closed its jaws on one of the hind legs and she has stung it to death. I'll take the bee out or they will kill her.

FLORENCE. Well, what are you dancing about?

ALBERT. Pull this stinger out of my finger! Can't you see anything? Get a move on you!

CECIL. I suppose the bee could pull its stinger out of the soft joint of the ant it stung, but not out of the tough skin of your finger. You know the stinger has barbs on it like a fishhook has.

FLORENCE. Ours can't quit work. See them carrying pieces of straw around.

KENNETH. Of the four Carpenters, one is eight times as large as the others. They say the largest ants of a colony can stand the greatest hardship. Let's leave them all until morning.

DOROTHY. But Florence and I'll not be here in the morning.

* * * * * *

ALBERT. Good morning, boys. Well, what have you got in the bottle?

KENNETH. Here's the report: The two flies—The

dead one is still dead; the live one is dead, too. The four Carpenters—No. 1, stung to death yesterday; No. 2, dead with one foot in jaws of one of our ants; No. 3, cannot turn over when placed on its back; No. 4, the big one, seems well. The nine ants of our colony and of the other colony like ours—No. 1, head cut off; No. 2, abdomen cut off; No. 3, dead; No. 4, Carpenter cutting abdomen off; No. 5, dying with foot of Carpenter in jaws; Nos. 6, 7, 8 and 9 seem all right.

CECIL. That's an awful report. We must never do such a thing again.

KENNETH. We didn't know they would fight. But I'm——

ALBERT. Well, look! No. 6 is dead, and No. 7 has lost its legs.

CECIL. The two that are left are climbing onto the back of the big Carpenter and running their faces into its face as if they wanted to be killed, also.

KENNETH. Why, the big Carpenter has fallen over dead, too.

ALBERT. I'll leave the two of our kind—the only insects of the sixteen that are now alive—by the door of our ants. Look! One of them is walking into the house, but the other is running away.

CECIL. Maybe the one that is running away belongs to the other colony.

KENNETH. Well, we've learned something, anyway. A bee can sting an ant to death, and a number of Carpenters can kill a bee.

ALBERT. Yes, and the Carpenter will use his jaws on other ants if cornered. And the largest of the Carpenters was the last to die—just as we expected.

CECIL. Here come the girls. Let's not talk about it.

CHAPTER IV.

July 24 to July 30.

Florence and Ant.

FLORENCE. Well, Ant, have you been learning anything lately?

ANT. Just compare my actions with those of the most stupid person you know. Why, I have "psychic plasticity."

FLORENCE. I don't know what that is, but I hope it isn't catching. I still think you are stupid. You won't follow the smooth path I made for you through the tangled grass.

ANT. Is that all?

FLORENCE. You often butt each other in the head, run over workers, ride on loads, don't know when I'm helping you push a load, and hold onto a seed while I carry you sixty feet and don't know what's happening.

ANT. Go on, if you're not run down?

FLORENCE. You are slow to detect an enemy, and have entirely too many visitors. Ants, both larger and smaller, come among yours, dodge them, out-run them, and deceive them.

ANT. It's my time to sleep. Wake me up when you are done.

FLORENCE. Hard work in the fields has made you dull. You don't hunt live game for food or fun. You let the rest do your thinking and hardly ever strike out alone. Better wake up.

ANT. Do not thousands of us live together in an or-

derly community? Have we not high social instincts? Can we not cross difficult places? Do we not help one another in providing homes, food, nurses, defense? You know we will give our lives to protect our homes.

FLORENCE. Oh, I don't know. I've never seen you do so yet.

ANT. Do we not care for our young? Do we not forget injuries and go to work as bravely as ever? Can't we tell each other things? When we are doing one thing, do we not see after everything else that needs attention?

FLORENCE. Pinch me when you are done.

ANT. Are we not hard workers? Are we not peaceable, cleanly, and good housekeepers? Does each not work for others first and self last? Do foremen have to drive us to work or see that we do it right?

FLORENCE. Oh, hum!

ANT. Have we any need of jails and taxes? Do we not mind our own business? Do we have to go to school to learn how to live and be useful?

FLORENCE. Remember that small brain.

ANT. I have a large brain. Mine is many times as large as that of a bug of my size.

FLORENCE. Say, Ant, I'm just fooling. Let's be friends.

ANT. All right, but don't start something the next time you are around.

Odor. Sense of Smell. Ammunition. Daddy Longlegs.

ALBERT. "Odor" seems to be a big word with ants. You must give off many odors and must be able to detect many.

ANT. We learn many things from odor—more than you can understand. Touch and odor together at the same

time—contact-odor—gives us a picture of a thing like you get through your eyes, but you can't understand how it does so.

ALBERT. Name some of your odors.

ANT. The nest odor lets us know our ants from others even when out of doors and helps us find our nest when near it. Then there is the trail odor. Each ant also has its own odor. Why, the odor of an ant may change every few months. One ant can't deceive the rest about her age.

ALBERT.—Your world must be different from ours.

ANT. Then there is the queen odor and the odor of eggs and babies at different stages. An ant can give off different kinds of odors when it wants to.

ALBERT. They say formic acid used to be made from ants.

ANT. Yes; most ants give off formic acid odor and various other kinds when they want to do so. These odors leave the ant as liquids, but evaporate or even explode on coming into air, and change to gases.

ALBERT. I understand.

ANT. Of course we use some of these liquids and gases as ammunition in attacking enemies.

ALBERT. I suppose that ants have been gassing the enemy for a good while—long before man learned how to do so?

ANT. Yes, for a few million years, as your professor would say. An ant might spray it in the air, shoot it, smear it, or run a spine into the enemy, and then force the acid out at the end of the spine.

ALBERT. You couldn't smell with your feelers because they are dry. If my nose were not moist inside, I couldn't smell.

ANT. We have little changed hairs on our feelers that are kept moist. The outer edge of a feeler is covered with

a film. Why, each joint in a feeler may detect a different odor from any of the rest. But contact-odor makes the best nose organ. You see, an ant's feeler contains a set of specialized "noses."

FLORENCE. No, I don't "see."

ANT. You can sing the music scale. Out of the different combinations of a few tones you get about all the music and about all the sounds in the world.

FLORENCE. Go on.

ANT. Well, odors are arranged in scales too and can be combined in thousands of ways to tell thousands of things if you have good enough a nose.

FLORENCE. I suppose you say "I smell" instead of "I see."

Ant. You can't see with your ears nor hear with your eyes and the sense of smell is about dead in your nose. All you need is to go blind and deaf and get a better nose to find out much that you are now learning through your eyes and ears.

ALBERT. I don't quite see how your gases can be so strong.

ANT. Uncork a bottle of ammonia under your nose or go to war, and you'll understand.

KENNETH. How long might an ant be kept from home and still be known by her sisters?

CECIL. One book says a year or more.

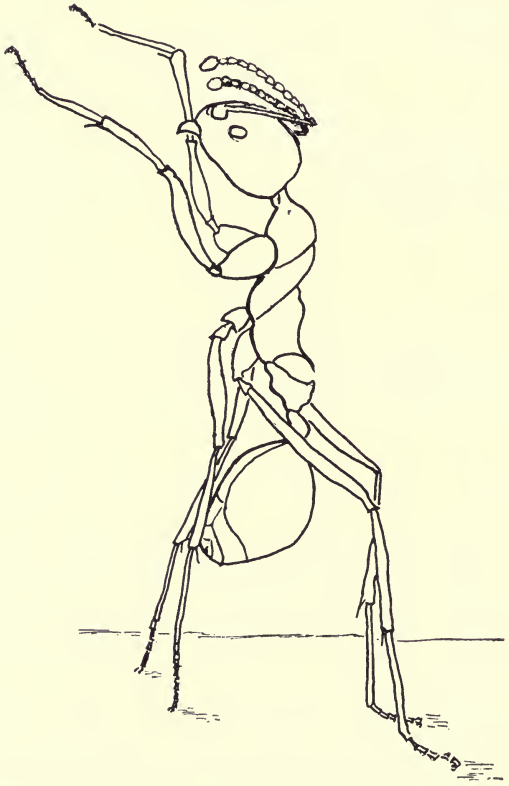
KENNETH. There must be a great deal of acid fumes in a nest unless the ants kill them with another kind.

CECIL. The moisture and minerals in the walls would take it up. That's what hardens the walls.

ALBERT. Of course the ants can smell the different kinds of food much better than we can.

KENNETH. A week ago I laid a little board on some

inch-high posts. The ants paid no attention. Today I laid some crushed almond on the board. An ant climbed up and took a piece home. Then several others and three visiting ants (acrobats) did the same.



A Harvester scenting the trail or something else.

ALBERT. They must have as good a scent as my dog has.

KENNETH. I then put some of the almond in the top

of a weed. An ant climbed up and got it. Next, the ants searched in the tops of other weeds.

CECIL. It looks like ants can learn.

DOROTHY. When one of your workers got crushed on the trail today, all passing ants stopped six to twelve inches before reaching the injured one, circled half around it, held on to their seeds, and went on their way home.

ANT. The gas given off was a danger signal.

KENNETH. One of our ants tried to carry a wounded visitor (Acrobat) away from the door, but soon dropped it and had a fit. Acid, I suppose.

ALBERT. I saw an ant rear up like a rabbit as if listening for something or smelling for something.

KENNETH. I gave the Carpenter a fly a foot from home. Owing to the smell of the fly or for some other reason, she lost the trail and had to climb to the top of a weed three times before she got a whiff of her nest odor. Then she took the fly straight home. I suppose it was for the babies.

DOROTHY. The ant could smell the nest odor but not the trail odor, eh? But maybe there was no trail odor, as there was no trail.

KENNETH. Possibly.

DOROTHY. The daddy-longlegs seems to be paralyzed as soon as you get hold of it.

ANT. It is. Did you ever notice how close to the ground it carries its body? Did you ever see it spring onto another animal? Daddy isn't as helpless as he looks on his stilts or he wouldn't now be on earth. He would be easy enough to kill if we could only reach him and if he didn't have such a bad odor when attacked.

CECIL. Besides acids, some ants have oil bags, too. The oil is used to make the sting work easy. Or it might be

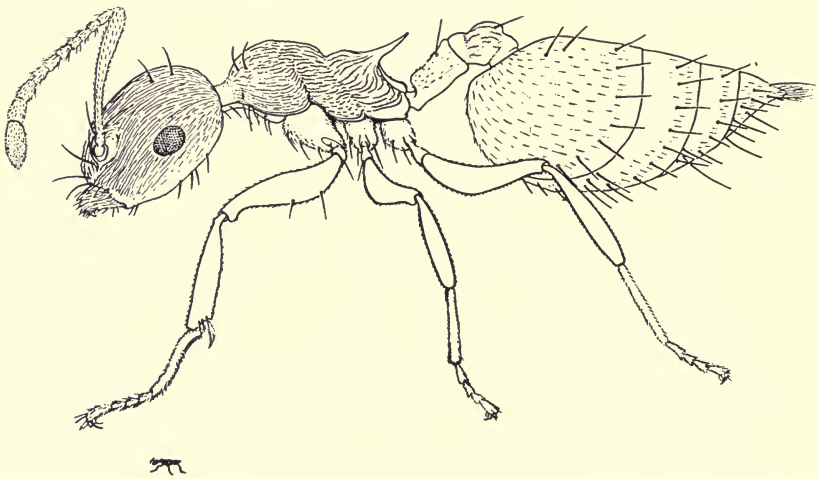
used to put on wounds made by the acid from an ant's own factory or from those of other insects.

The Acrobat.

ALBERT. What kind of an ant is this? See it double its abdomen over its back. Barnum and Bailey's circus ought to have it.

ANT. It is called the Acrobat ant ("Crematogaster lineolata." Say "subsp. coarctata"—Emery). Plenty of them around here. The Fire ant lives in California, too, and some of the kind that can raise mushrooms to eat.

KENNETH. Who knows something about the Acrobats?



WORKER ACROBAT ANT.
(Cremastogaster lineolata.)
Notice the shape of the abdomen, which is often held up over the thorax.

CECIL. They are rather shiny and rather common. Their former home was in Asia only. They generally have small colonies, are rather sluggish, and are seldom seen in the house of man.

FLORENCE. They are a fright when performing. Watch this one double back its abdomen and shoot this straw when I hold its head down. Doesn't that beat you?

CECIL. The jaws of the Acrobat are small. It depends much on plant lice and plants for honey dew. These ants often guard their cows and sometimes build stables for them. They may have several branch nests and may even live in the home with other ants.

KENNETH. I can't find out what the Acrobats around here do eat.

ANT. Keep a lookout and you will see.

This is the ant that never waits for an invitation to dine with ours. It herds plant lice for cows and builds stables for them. It can double its abdomen over its back and shoot an enemy in front.

ALBERT. The Acrobat doubles its abdomen up over its



This Acrobat would punish an enemy as it is trying to punish the straw.

back and fires at an enemy in front, while the Carpenter doubles its abdomen under its body and fires at an enemy in front.

CECIL. Yes. Take an Acrobat by the head or hold its head down with a knife blade, and you can generally see a drop of acid.

KENNETH. I laid the body of a bug in the doorway of our ants, but the Acrobats beat ours to it. They would point their abdomens toward any ant that touched them—

up, down, sidewise, just like a cannon.

FLORENCE. Yes, but tell it all. Our ants wouldn't give up, and finally got hold of the bug and dragged it, Acrobats and all, into the house.

DOROTHY. I don't like the Acrobats, because they are always snooping around in other ants' business.

CECIL. But they know a lot. The Acrobats were coming home on a long trail, one at a time. I placed a crushed one on the runway, a foot from the door.

DOROTHY. Well?

CECIL. The first traveler to come up to the crushed ant examined it carefully, turned and went back up the trail six inches, and there stopped stone still, never moving a foot for twenty-five minutes.

DOROTHY. Go on.

CECIL. The other Acrobats came down the trail, one about every minute, and each was halted by the guard. After crossing feelers for a few seconds, each traveler turned and went back. Twenty-five ants did this before I had to leave for school. Now isn't that wonderful?

DOROTHY. Yes.

CECIL. Of course the guard told the other ants that a murder had been committed, and that they had better turn and go back. Those going back met others coming in, but did not tell them the news. I have seen Acrobats do this same thing several times.

FLORENCE. Tell us more about the habits of this ant.

CECIL. It's no use. Just remember all that was said about the Carpenter and all that will be said about the Carpenter. Their habits are very much the same.

KENNETH. I dropped a wounded Acrobat down her own stairway. Then I dropped one of our ants in and held my finger on the door for a minute. Our ant rushed out,

dragging several Acrobats, but all let loose except the wounded one. This shows that the Acrobats didn't want to kill ours.

ALBERT. And when I tried to get our ants to help loosen the jaws of that wounded Acrobat, they wouldn't, and I had to pry them apart.

DOROTHY. I never see the Acrobats carry any of their sisters, dead or alive.

KENNETH. I have. Twice I've seen an Acrobat carry the dead body of a sister across the sidewalk, and I saw that ant carry a crippled nest mate away from the door of our ants.

ALBERT. The Acrobats often enter the home of our ants, but ours never return their visits. I dropped another one of ours in at the Acrobat door, but she was chased out by a dozen ants.

DOROTHY. I spread some bits of paper with honey and left them at the door of the Acrobats. Ten pieces were carried in and the ants ate the honey on the other pieces.

FLORENCE. I gave them some honey on paper, too. Twelve ate at the first table, twenty at the second, forty at the third, and seventy-five at the fourth. Time, five to eight in the evening.

ALBERT. I've seen two hundred of these Acrobats out at a time.

FLORENCE. The Acrobats must be hungry. I gave them some squash seed and they ate it.

Ants Don't Always Agree.

KENNETH. A large stinging insect fell at your door. Some of the ants fought it, others tried to drag it away, and some tried to take it indoors.

ANT. Neither ants nor men can always agree.

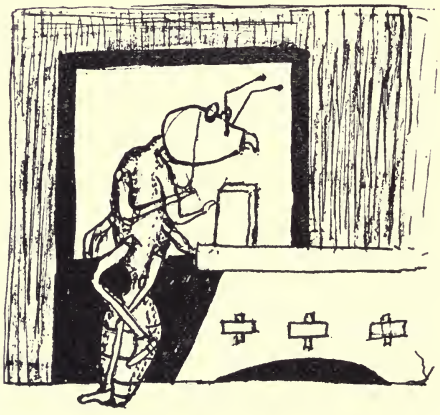
KENNETH. Two of your ants were slowly dragging

the body of a large insect home, while a third stood on it and ate. Finally, the workers stopped, pulled the one loose that was eating, and carried her off the premises. But she took a mouthful along.

ANT. Maybe the hot sun had dried her jaws fast, and she couldn't let loose. These three ants were not all thinking the same thing, were they?

KENNETH. An ant was carrying a seed away from home. Another ant bit her feet and legs, took the seed away from her, and carried it back to the nest.

ALBERT. Once two ants couldn't agree as to which



way a seed should be carried. One picked the other up and carried her into the house. Looked like a joke to me.

CECIL. Sixteen ants tried for half an hour to decide what should be done with one that had got caught in the coil of a filaree seed. One party decided to drag the combination into the house. His honor, the judge, ruled in favor of the other party and they took it to the rubbish heap.

Ants Have Been on Earth a Long Time.

ALBERT. You say that ants have been on earth so much longer than man. How do you know?

ANT. Because fossil ants are found in old amber and in old rocks. Man hasn't been on earth long enough to have a fossil—a dead one.

CECIL. Yes. Fossil ants are found in the amber of Sicily and on the shores of the Baltic sea. Amber is fossilized pinewax, or fossil resin. The wax formed on the pine trees that once grew in these regions. The trees decayed, and the wax became buried, and then fossilized. Fossil ants are found in stone, too.

Age of Eggs, Larvae, Pupae, Workers and Queens.

KENNETH. How long from the time an egg is laid until it becomes a full-grown ant?

ANT. That depends on the time of year, on temperature, and on other things, but I can give you the time for the Argentine ants living in California. With that ant, it takes about twenty-eight days for the egg to hatch into what we call the baby, grub, maggot, worm or larva. Then, in about twenty-one days more, the larva becomes a pupa. In about fifteen days more, the pupa has changed to a young white ant. In a few days more it has hardened up, changed its color, and is ready for work.

KENNETH. About seventy-one days from the time egg-hatching begins until the young white ant appears—over two months.

ANT. That young ant is pretty helpless for a few days and has to be fed and attended—has to be taught to walk, you know, the same as man's child.

KENNETH. Does this little troublesome Argentine spin a cocoon?

ANT. I think so, but our kind of ant doesn't. Our pupae are said to be naked.

KENNETH. Do the nurses ever help the young ant out of the cocoon?

ANT. Yes, and help unfold its legs and feelers, and wings, too, if it have any. The young ant helps, also.

KENNETH. I guess I understand. The baby has no legs or feelers, and spins a cocoon when it is ready to become a pupa. In the cocoon the pupa eats nothing, but grows legs and feelers, and then out comes an ant.

DOROTHY. You told us about the age of the Argentine ant. How about other ants?

ANT. A worker has been known to live five years, and one queen was known to live fifteen.

DOROTHY. Then some queens may be older than I am.

ANT. Yes, but you will find that they are not very good looking. The hard work of mining her first nest all alone sometimes wears off her shiny coat, scratches her body, and makes the queen a sorry sight the rest of her life—even toothless, and with jaws badly worn.

DOROTHY. How does she put in the time? What does she work at?

ANT. As a rule she works none. She just lays eggs. Servants guard her, feed her, and take care of her.

Kind of Ants. The Argentine Ant.

CECIL. Tell us more about that troublesome Argentine ant.

ANT. That kind of ant covers about 4,000 acres near San Francisco, and about 1,000 acres around Los Angeles. Other ants don't like that one any better than man does. It captures all other kinds or drives them away. So, the time may come when the Argentine will be the only kind in California.

CECIL. The worst household pest of all ants. That's a bad record.

ANT. As the queens do not fly, it is not spreading very fast. It is only one-eighth of an inch long—only half as long as we are. It would take eight of them to make an ant as large as I am. They are little but mighty when it comes to fighting.

CECIL. How can a small ant like that whip others that have ammunition?

ANT. There are more of the Argentines, and they just keep on fighting until the ammunition of the enemy is all gone. Of course, many of the Argentines are killed.

CECIL. What harm does this ant do?

ANT. It is said that, in some places in this state, ants have reduced the value of land ten to fifteen dollars an acre.

KENNETH. You are not well posted. Within the past ten years the Argentine ant has spread to many other places than those you named. There are plenty of them in Balboa Park, San Diego, right now.

CECIL. What do you know about them?

KENNETH. I know they stole honey from bees kept in the Park. A young turtle lay on his stone island in his small tank in the museum. The keeper put a piece of boiled egg on the turtle's back.

CECIL. Well, then what?

KENNETH. The Argentine ants used their floating sisters as a bridge, crossed the water six inches to the island, and stole the egg. The bridge was destroyed, but was re-formed.

CECIL. I wish every Argentine ant in the state was destroyed, for, as you say, they will drive out or kill all other ants.

ALBERT. That ant searches through the house for sweet stuff, eats young chicks, gives tender care to aphids and scale insects, ravages orange trees, corn, sugar cane, cotton, and so far man is almost helpless against this pest, the newspapers say.

KENNETH. Speaking of bridges, I placed three oat straws end to end and made a bridge six feet long. It reached out six feet from a nest of little red ants over some tangled weeds and grass. I wish you could have seen the ants skipping along my bridge of smooth shiny straws from end to end.

FLORENCE. Are there more ants than any other insect?

CECIL. There are more kinds of butterflies and more kinds of beetles in the world than kinds of ants, but there are more individual ants than any other insect.

DOROTHY. You say 5,000 kinds of ants have been named. Of these, how many live in California?

ANT. About forty-six. The Carpenter is the biggest ant in the state, and there are five kinds in California.

Population, Residence, How Long Ants Use the Same House.

CECIL. Is the population of the ant world increasing?

ANT. Some kinds of ants are increasing, others decreasing. You know of ants that thrive in the presence of man —move when he does and return when he does—follow him like the dog and dandelion. Some of the best kinds are already gone and others are going on account of man's ax and plow.

DOROTHY. Where all do ants live?

ALBERT. Let me read what the book says: "Ants live from the seashore to the timberline on the mountains, and from the dryest desert to the dampest forest. They build

in the sand and live in the quiet desert, or under a railroad track in the constant thunder and jar of great passing trains."

DOROTHY. Some one of you said there are more ants in many a county than people in this whole country.

CECIL. Why, I think there are as many ants in a hundred little towns, each of a thousand families of people, as there are people in the whole world.

DOROTHY. You forget there are 1,700,000,000 people in the world.

CECIL. I think there are 13,000 ants in this town for every family of people living in it, and there are only a few ants here. Suppose we have one thousand families of people here. Now multiply 13,000 by 1,000. A hundred such towns would give 1,300,000,000.

DOROTHY. I can hardly believe this.

CECIL. Why, one book speaks of a single colony having 500,000 ants in it. Two hundred such colonies would equal the population of the United States. Of course, the ant colonies around here are small.

DOROTHY. How many Carpenters in a completed colony?

CECIL. About 2,000, the books say.

KENNETH. How long may the same colony use a nest?

CECIL. I guess there is no particular time, but ants have been known to use the same nest forty years.

ALBERT. How many kinds of Harvester ants in California, and what's the population of a colony?

ANT. There are six kinds in this state, and the number in a colony of our kind around here ranges from 4,000 down. The Harvesters are the most common ants of the plains and foothills. Some of the nests well up in the Sierras may be seen for miles. These ants are very easily

destroyed, as they live in the ground and the nests are in plain sight. You could destroy our colony in a minute.

FLORENCE. There are about a dozen colonies of our kind of ants within three blocks of us. Not very many, as ants go. One of these enrolls 4,000 ants and has branch colonies that pass back and forth.

CECIL. A farmer can scarcely cross a field in many parts of the country without putting his foot down on a colony of meadow ants at every step. These ants own a share in the field and he owns a share. But who ever heard of an ant having any rights? I think both ants and men have rights until they forfeit them.

CHAPTER V.

July 30 to August 10.

Harvesting, Trails, Getting Lost, Use of Six Legs.

FLORENCE. About 700 of your workers started out for the Bermuda-grass seed thirty feet away. Did they follow a leader?

ANT. I suppose they followed a few scouts that had discovered the field, but no one particular scout.

FLORENCE. You better drill your ants, for they didn't march in any order.

ANT. But look at the sticks, weeds and grass we had to climb through.

FLORENCE. Why don't you build roads through the dry tangled grass?

ANT. We do whenever we think it worth while.

FLORENCE. Were all your ants in that procession?

ANT. No. Some were left to attend the babies, eggs and queens; others carried chaff from the nest or graded the yard, while some of the miners carried dirt from below. Of course, a few might have been busy as guards, undertakers and so on.

FLORENCE. Why do you lug cantaloupe seed, squash seed and apple seed home every day when you know that you can't crack them?

ANT. Because I have learned that you will crack them for me.

FLORENCE. So you learn, but don't have to go to school to do it. Today I placed you in my hand, took an

apple seed away from you, hulled it, gave it back, placed you on the ground, and you toted it on home. I guess I'll make you one of my pets.

ANT. Pretty good friends, after all, aren't we?

ALBERT. When I threw some grass seed on your trail, you were disturbed about as much as when I drew my finger across it.

ANT. And for the same reason—you had disturbed the trail odor.

ALBERT. I should think you would carry home many seeds that have no kernels in them—make a long trip for nothing.

ANT. We generally bite a seed to see if it is any good before we carry it home. But sometimes we make mistakes.

CECIL. I suppose that ants can tell by the weight and size, too.

ALBERT. One day several hundred of you started for the seed field, but why did you all change your minds and go back home?

ANT. Why ask? You know that cats, dogs, chickens, birds, rabbits, horses, cows and children pay not the least attention to where they are stepping.

DOROTHY. Why, I step around ants, when I see them.

ALBERT. I can't understand why you lose your trail when I draw my finger across it. Tell me again.

ANT. We leave an odor along the runway to mark it. Doesn't man mark his trail when he lays it out through the forest? Your finger removes the odor from a section and we are bothered for a time, of course. But the rough sides and smooth tracks of old trails also help to guide us.

ALBERT. One of your ants was alone out in the bean

patch. It was not bothered when I drew my finger across in front of it.

ANT. It wasn't following a trail. It might have been a scout or it might have been ordered from home. Sometimes we hunt alone for game.

ALBERT. I am easily lost and so are you. I often get turned around in San Diego, and once I got lost in the school house. When I'm lost I don't know which way home is, and I don't believe you do, either.

ANT. When lost you might not know your own home if you would see it, but we could tell our home by the nest odor, and I think my sense of direction is better than yours. A pigeon can beat us both.

ALBERT. When lost I use the sun, moon, moss on a tree, or some familiar object to guide me, or I go back and start over.

ANT. And I hunt for our trail odor, nest odor, or some familiar object; or I depend on the direction of greatest light, or go back and start over. The direction of the wind and the slope of the ground might help a little. I suppose we both would follow a crowd if it was the right kind of a one.

KENNETH. Last evening 950 of your ants formed two trails. Then they came together on one runway, but soon scattered over the bean patch, where there is nothing for them to eat.

ANT. Maybe they were hunting dead cucumber bugs, ladybugs, earwigs, or other insects.

ALBERT. I know that your ants spread out over a few feet at the end of the trail in search of seeds, but these spread out near the nest and were lost to me. I have seen one ant search for insects, but not the whole gang until this time.

KENNETH. When about to start from home from the harvest field, you grasp a seed tight in your jaws and let the sharp end run back between your front legs so the long tail that sticks out in front won't wabble as you walk.

ANT. Yes, and we hold onto the hard ground with our claws so the heavy tail in front won't tip us up. I spread my legs apart so the hard seed coats won't wear the muscles out.

CECIL. But sometimes the ants drag their loads instead of carrying them.

KENNETH. I see your forelegs have the largest muscles, the hind pair next, and the middle pair the smallest.

ALBERT. I haven't but two legs. What do you want with six?

ANT. Man has four legs, or used to have. His arms are really legs. You might as well ask me why some animals have a hundred. I never heard of an animal with too many for its own use. I can pull with my front legs and push with my two hind pairs. I can stand upright on my two hind pairs and use my two front legs as you do your arms. Like you, if a leg is injured, I limp.

ALBERT. Well, I'm not a four-legged animal, and I'm glad of it or I might be eating out of a trough.

KENNETH. I made a nice smooth trail for you through a pile of stones that your ants were climbing over, but they wouldn't use it.

ANT. Would you send an army up a canyon road if the hills and caves were full of the enemy?

KENNETH. Then I thought I would teach you to use my road. So I scattered one hundred and thirty cracked muskmelon seeds in it. Within half an hour the ants had entered my canyon and carried one hundred of the seeds

home. Yet, the next day they were climbing over the stone pile, as before.

ANT. That was all right.

KENNETH. Who told the ants about the seeds and where they were? Why, a hundred and fifty workers and guards poured out of the nest in ten minutes, after the kernels. They moved several abreast at first.

ALBERT. If I should drop an ant on a trail on which ants were going both ways and carrying nothing, would it know which way home is?

KENNETH. I left six ants on a pile of melon seed three feet from a trail on which ants were going both ways and carrying nothing. After fifteen minutes' search the six ants got the odor and started for the runway. Two of the six picked up one seed each and took them along, so I could follow these after they had joined the others on the trail.

ALBERT. What did you find out?

KENNETH. One of them see-sawed toward and away from the nest several times when it struck the trail, until it was nine feet further from home than when it first hit the runway. It then turned and went straight to the nest.

ALBERT. What about the other one?

KENNETH. After going fifteen feet in the wrong direction on the trail it came to a well-known wooden trough and then turned and went home with its load.

CECIL. Like us, the two ants didn't know which way home was until they came to some familiar object, maybe.

KENNETH. The ants going both ways may have confused them.

ALBERT. Could one ant track another by the odor left by the feet?

ANT. Yes, if it touch the trail with its feelers—use contact-odor.

DOROTHY. I counted 1,035 of your ants on the trail yesterday. We never counted over 950 before.

ANT. You may count more than that some day. Ours is now a small colony.

KENNETH. Look! This drove of ants are going home because we were walking around in front of them.

CECIL. The trail is now sixty feet long and crosses the alley for the first time. Food must be getting scarce.

ALBERT. Once, when nearly all our ants were out on the trail, they had to cross a dangerous footpath. For some reason they left a hundred guards at the crossing.

FLORENCE. Ha, ha, ha! That blurt of wind nearly blew you off the yard. I don't see why you want these loose earth pellets lying around your door. You can't hold onto them when the wind blows like you can to the hard ground of the trail.

ANT. Ants can't work much when the wind blows hard.

FLORENCE. Strange how an ant will generally take a straight course over clods and stones, instead of going around them. What would you think of me if I would go over a house instead of going around it?

DOROTHY. Well, ours are now going eighty feet for seed. A passing auto has just run over three ants in the alley.

ANT. Yes, and the paper boys, other children and different animals often step on us and don't know it. Why, one of you girls sat down on a trail of workers the other evening.

DOROTHY. I wouldn't blame you if you would move. I suppose you will before long. Haven't you food enough stored away to last over next winter?

ANT. No. When winter comes we store food, close the door and wait for spring. An ant doesn't have to eat so much in winter time when it is quiet and not working.

Teasing the Ants.

FLORENCE. I handled a straw today and threw it and another one down by the door. The ants bit the handled one from end to end before carrying it out, but took the other one away at once.

ANT. Their fine sense of smell made them suspicious of the first one.

DOROTHY. Why don't you run home when I whip you with a straw?

ANT. Home is a poor place to take an enemy. What we want at such times is the enemy.

DOROTHY. When I tease you with a straw and throw you down by the door, you just run back and search for me.

ALBERT. When I punch you with a straw, why do you grip it with your jaws and let me carry you away?

ANT. We bite an enemy to hurt it and hold on for the same reason. We don't think of ourselves.

ALBERT. But you will hold onto a seed and let me carry it home for you.

ANT. I would hold onto a seed while an ant carried it home, too, if it was my seed.

ALBERT. Maybe you don't know when you are being carried. Once a railway train was carrying me when I thought it was not moving. Another train alongside fooled me.

ANT. I don't know. You didn't know whether you

were moving or not when on the train. Ask an easy question.

KENNETH. I touched an ant with a straw four and a half inches long—four and a half, mind you—and she grabbed it. I then laid the straw across the top of the ridge of your yard. She hung on and dangled from one end of the straw until her hind feet touched the ground. Within five minutes she had geed the straw around on the pivot and moved it from the yard. She handled it just as I would have handled a log.

Helping, Rescuing.

KENNETH. I'm glad to see your ants help each other. One of your small nest mates couldn't drag a bug. Along came a large ant, picked up the load, and easily carried it home. The small one then went back to the harvest field.

ANT. You will not see such a thing happen very often.

KENNETH. I threw dust on an ant six times and dropped it at its door as often, but every time it would run back and search for me.

ANT. It was thinking of the colony, not of itself. But don't imagine that one of our ants can't be frightened.

KENNETH. Well, it wasn't afraid of me, for it climbed onto my fingers and bit them each time.

ALBERT. Today I set a straw on end in your door and the lower part rested on an ant and she couldn't get loose. Another ant lifted the straw off and the prisoner walked away.

ANT. I guess the ant was just trying to get the straw out of the door or thought it was biting an enemy.

FLORENCE. I think the boys are often mistaken when they think the ants are so wise.

KENNETH. I brought one of your crushed ants from the alley and dropped it at the door of the little Garden ants that have built right on your yard. One of yours rushed up much excited and carried the body away. Again I dropped the body by the door and it fell down inside.

ALBERT. Then what happened?

KENNETH. Six Garden ants came home. Four ran away, but two entered the door. Then five of our ants came up and stayed half an hour. They jumped and jerked and seemed to be afraid of something.

ALBERT. Afraid of acid ammunition, I guess.

KENNETH. Finally one of ours squeezed in at the small door and went down after the body of her sister, but came out without it. She repeated this ten times and then gave up. She was all covered with dust and almost overcome with acid or something.

FLORENCE. I saw her. Once she knocked some sticks across the door and had to remove them before she could enter again.

CECIL. One of the odors of the Garden ant is pleasant to us, but it or another one may be poisonous to ants and other animals. Flowers have pleasant odors, but farm stock won't eat the bloom of some kinds.

ALBERT. Is that the end of the ant story?

KENNETH. No. The next day one of our ants was still going after the body of her sister, but failing. I don't believe she could get it up the small stairway, but maybe the Garden ants wouldn't let her have it.

ALBERT. So our ants will risk their lives by going into the house of a strange ant to recover the body of a dead sister. And they will keep up the search for at least twenty-four hours.

CECIL. I think that is wonderful. Ours pay no attention to those killed on the trail.

ANT. You'll not often have a chance to see us rescue a sister.

CECIL. Well, I saw one of ours rescue another of the same kind, but from another colony. I dropped both of them at the door of Longlegs (a long-legged ant), and where several big-headed soldiers were on guard. Now, listen: Our ant grabbed the other and carried her six inches away from the danger point. This was done before the soldiers had time to make an attack. What do you think of that?

FLORENCE. Strange that our ant would rescue the other one from the bulldogs when she would not have allowed it around her own door. These soldiers are a fright. They do remind me of bulldogs.

CECIL. An ant was carrying home a woolly seed that caught on something and she couldn't loosen it. Another ant came along, helped unfasten it, and then went on to the seed field.

FLORENCE. Ants think, eh?

KENNETH. Speaking of Longlegs, I saw one of them acting in a suspicious manner today. It pretended to be working for our ants. It dragged the body of a dead Carpenter up to the door of our ants and left it as if for food. It must be a scout or belong to the secret service.

CECIL. Why, I saw a Carpenter drag the dead body of one of her own sisters up to the door of our ants and leave it; for food, maybe.

DOROTHY. Our good-natured ants must be very popular.

KENNETH. I pasted an ant in some stiff mud last night. This morning the ants had dug a three-eighths inch hole around her and were trying to pull her out. I loosened

her and the ants took her to the rubbish heap. She had lost a feeler. No; I won't do such a thing again.

DOROTHY. What else have you thought to do?

KENNETH. I poked a dozen Carpenters into a tangle of spider web, but they all got away except one. One of those that escaped came back and worked her way to the entrapped ant, told her something, and left. It did this same thing twice again.

CECIL. Then you set the prisoner free yourself. She found another insect that had been snared, loosened it, and let it fall to the ground.

Bees and Ants Compared.

KENNETH. How about the size of bumblebee and wasp colonies? Yes, and bee colonies?

ANT. There are only a few in a nest. These insects live from a few months to twelve. Of course, the queen bee may live a few years.

FLORENCE. Where do bees get the wax for the comb?

ANT. It comes out of the bee's body much like perspiration exudes from your skin. Did you ever eat the wax at a wound of a cherry tree? You see a tree can make wax, too.

FLORENCE. Neither I nor the bee could live on honey alone. What does a bee do for bread and meat?

ANT. It eats pollen.

FLORENCE. How do bees stop up cracks in a hive?

ANT. They gather gum from trees for that purpose.

FLORENCE. You seem to eat most anything, while a bee can't eat anything but honey, fruit juice and flower dust.

ANT. And now you see one reason why there are so many more ants than bees.

FLORENCE. Yes, but you are not smart enough to make your houses and baby cribs all alike, and out of wax or paper, as hornets, wasps and bees do.

ANT. You mean I am too smart to do this. Why, our house is easier to build, takes less time, may last many years, and we can leave it at any time and build a new one in a few days. Then, we can move back to an old home if we want to.

KENNETH. But some ants build paper houses, even mud houses, up in trees.

FLORENCE. Bees have but one queen. Why do you want to bother with taking care of so many? Is it because several queens can lay more eggs than one, or so if one dies you may have others left? Don't your queens fight each other?

ANT. Not in the nest, but they might if they should meet while out looking for a place to start a new colony.

FLORENCE. A colony of bees lives in the top of one of the porch columns at our Hamilton school. One lit on a girl's hand the other day.

DOROTHY. I'm glad no one has been able to figure out a way to get their honey.

FLORENCE. A bee can fly miles while you are dragging your load sixty feet through dust and tangled weeds, and she can keep herself clean, while you get all over dirt.

ANT. Well, go on.

FLORENCE. The bee's food is in a beautiful painted cup, held up in the air where she can see it or smell it, while you have to hunt for yours in the rubbish and dirt.

ANT. Wrong as usual. Our hard struggle and the lack of it in bees are two more things that have made the ant world surpass the bee world.

FLORENCE. Well, I wish man had been given wings, anyhow.

CECIL. If man had been given wings, he mightn't know any more than the condor and might be as scarce as the dodo.

FLORENCE. Well, man got tired of waiting for wings to grow, and so now is making his own.

CECIL. Yes, and when the sky begins to rain bombs, he may see his mistake.

ANT. Here, children, you'll have to get off our yard if you're going to quarrel.

Men and Ants Compared.

ALBERT. Is one kind of ant as smart as another?

ANT. Are all kinds of men equally wise? Let me see if I can read: "You have your savage hunters living in the wilds and fighting single-handed—so have ants. You have your shepherds with their animals and houses, that live on the products of their flocks and combine in battle—so have ants."

ALBERT. Right. Go on.

ANT. "You have your great civilized farming people that harvest their crops, build their houses, and combine in war—so with ants." I am a harvester. I hope you are, also.

CECIL. Yes, civilized man is a harvester, but he is more. He has gone ahead of you because he can make tools, trade, and improve.

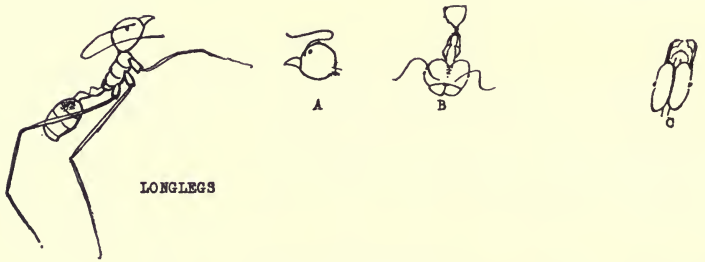
Longlegs.

FLORENCE. We've been calling the ant that has such long legs and long feet "Longlegs." Is that good enough a name?

CECIL. That ant (Pheidole longipes) is one of the harvesters and belongs to the same tribe as our ants. They have the build of a race horse. They feed on larvae, insects, seeds, and also give each other liquid food from the mouth.

FLORENCE. See how its jet black eyes show on its light color.

CECIL. It is variable in size except the kings. The big-headed ones are soldiers, guards, and nut and insect crackers.



(Pheidole longipes.)
A and B—Big-headed soldiers of Longipes.
C—Under view of one kind of worker.

FLORENCE. I've seen the soldiers.

CECIL. This ant has been on earth a long time, and has developed casts for special duties. It makes small craters, and a number of guests live with it.

KENNETH. Yes, and it may use tree-hoppers and caterpillars for cows. I wonder why it falls from the ceiling down on my book sometimes when I am reading at night? I guess the light attracts it—or is it after flies? It has the movements of a thief. Look at its sharp dagger jaws.

FLORENCE. I see that the Longlegs carry some of their ants around the same as ours do.

ALBERT. A Carpenter was scared into the den of the Longlegs last evening. This morning her head and torn body lay at the door. Then I saw two of the soldiers tackle another Carpenter. She lost a leg below the knee and one soldier lost a jaw.

CECIL. I saw that. I carried the Carpenter to her home, but the soldier's jaws still held on to another leg. The next day I left a Carpenter at the door of the Longlegs. The one-jawed soldier rushed out, but hiked away in a hurry.

ALBERT. One of the Longlegs came home last night carrying another that had lost its abdomen, while another one lugged a big-headed soldier. A third carried a salt grass seed, a fourth a bug, and a fifth the leg of an insect.

FLORENCE. Their soldiers have large brick-red jaws. They seem to have good teeth. I wonder what's in the big head?

KENNETH. Something, for two of them stood on their heads in a vial of alcohol.

ALBERT. I ran a stick into the nest of Longlegs, and eight big-headed soldiers came out and searched for me. The one that is minus a jaw is still doing business.

KENNETH. When I opened the garage door, there lay a colony of Longlegs on the floor—babies and all. The soldiers didn't help carry the babies away.

ALBERT. The following were found drowned in a bucket of water that had been sitting in the garage for several hot days:

Longlegs—		
Workers	280	
Larvae	24	
Pupae	96	
Soldiers	16	—one with broken jaw.
Total	420	
Robbers (Ecitons)	8	
Grand total	428	

One pupae and six larvae were still alive. Probably the water had a little oil on it.

KENNETH. Had the ants carried their babies to get a drink or were they trying to escape from the robbers? Did they intend to float on the water with their babies to escape the robbers? Or did the oil on the water capture them? Who told you some of the ants were robbers?

ALBERT. Ant said they were robbers, but that we would have to find out about them ourselves.

KENNETH. The other day I found a number of Longlegs trying to escape across a cement sidewalk with their young. Their baby queens were so large the workers could not drag them, in the excitement. Wonder if they had not been attacked by robber ants also?

ALBERT. We must keep a watchout for these robbers and learn about their habits. Maybe we can find out what their name is also.

CHAPTER VI.

August 10 to August 20.

Carrying Things. Trails. Heavy Loads.

CECIL. I found one of your ants on top of one of the tiny posts we drove on your yard, but its abdomen had been cut off. I suppose it had been either carried or ordered from home.

ANT. The ant may have been injured in any one of several different ways.

DOROTHY. One ant brought another out of the house and left it near one of the tiny stakes on the yard. The outcast climbed the stake and crossed feelers with a third ant for a long time. The third one then carried the outcast down and up the stake, making six round trips without stopping. I suppose the third one was an "outcast" also.

FLORENCE. I saw an ant carry two out of the house at once. One of them climbed a tree (weed), and the other one struck out across the country.

ANT. You can't get it into your head that of a thousand or two of ants, that at most any time some must be old and worn out, sick, crazy, or crippled, and have to be taken out of the house.

FLORENCE. Of course, too, some are exposed to diseases that are catching—have the measles, mumps, smallpox or fever, and should be removed. I suppose we are mistaken when we think you are giving your ants a joy ride.

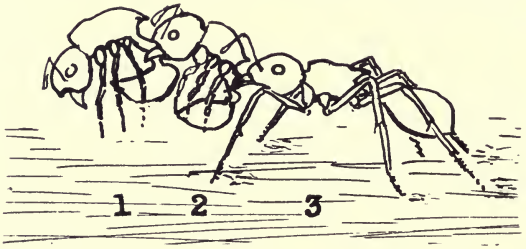
ALBERT. I saw your ants carry out two large winged

queens and some babies, hold them a few minutes, and then tote them back.

ANT. We take them out to air them. The queens generally go out themselves to take exercise and to get fresh air.

DOROTHY. It took four ants to get a balky one out of the house. Then the four let go one by one as it was dragged away.

ALBERT. An officer carried one of your ants out of the house three times, and each time the ant broke away and ran back. At last the officer gave up and quit trying.



Carrying Two Ants.

CECIL. One of your ants had two things in mind at the same time, I guess. She carried an aunt out ten feet, laid her down, and then went on to the harvest field. The one carried out had lost a foot and couldn't walk.

DOROTHY. I saw one of ours carry a wounded sister six feet away. Five minutes later another ant got on the track, and followed it like a dog would a rabbit trail. After examining to see what was going on, it left. Might a single ant leave an odor along a trail?

KENNETH. The fluid sack gets so full sometimes, that the ant has to discharge it, whether it wants to or not. But the feet leave a trail odor that can be followed, also.

ANT. Cecil is having a thought. Let's hear from him.

CECIL. I saw one of our ants carrying out a dead one, and the dead one was carrying a live one. It was like this: For some reason, the dead ant clasped a live one by the pedicel. Then a third ant picked up the dead one, and thus carried both away at once.

FLORENCE. You'll have to diagram that story if you want it understood.

CECIL. When I loosened the jaws of the carrier, the other live ant went back home, but with the dead one still hanging on. Then I loosened the jaws of the dead one, and the live one again went home, to be carried away by a fourth ant.

FLORENCE. The other one, the live one, the dead one, the live one, the other one, the dead one!

DOROTHY. I saw you dragging a lot of charcoal home sixteen feet today. Are you going to have a minstrel show, or do you have to carry something so you can get by the guards?

ANT. Why does your druggist keep charcoal to sell? Anyhow, our workers found it near the fruit parings, and maybe it had some dried juice on it.

ALBERT. Day or night I can generally find from one to six of your ants on the tiny posts we drove on your yard.

ANT. In most cases these ants have been ordered or carried away from home.

FLORENCE. Why don't you climb the two weeds on your yard like you do the little posts?

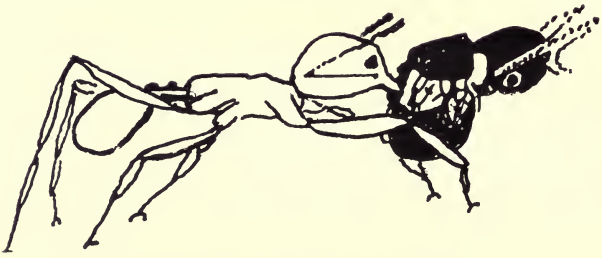
ANT. Because they have grown bristly, sticky hairs on the stalks to keep us from bothering the seeds on top. But sometimes I climb from leaf to leaf to see how the seeds are coming on.

DOROTHY. One of ours carried out a young dead white

ant and laid it down. Another ant picked it up and carried it far away.

KENNETH. I took the body of a young white ant down to the colony like ours under the sidewalk. An ant held its mouth to it for about ten minutes, picked it up, carried it a short distance, and handed it over to another ant, mouth to mouth. The last one carried it away.

FLORENCE. You don't carry out all your cripples, for I saw one working that was minus a leg and one that had a caved-in abdomen. I also saw one at work that had an ant head fastened onto one leg.



How an Ant Carries a Sister.

ANT. We might not chase a cripple away from home if it were not sick.

KENNETH. I saw an ant carry a wing fifty feet to her home and hand it over to an inspector that laid it down by the door. A third ant picked it up and carried it six inches away.

DOROTHY. Let's ask Cecil why one ant carries another.

CECIL. I think one ant may carry another for different reasons, as follows: Taking sister a joy ride, bringing home the lost, bringing home the lazy, carrying home the sick, carrying one that has refused to move, carrying out

the sick or worn-out or one that has been exposed to some catching disease.

DOROTHY. I thought an ant always carried the sick away from home and never to the home.

CECIL. If an ant had a sunstroke or a chill on the trail, I think another ant might carry it home. The books say that ants may carry home the lazy, but I think the "lazy" include those that have had a sunstroke or chill or something, and may get well.

DOROTHY. Just how does one ant carry another?

CECIL. By a leg, or the back, or jaw, but seldom by a feeler. I think an ant could easily lift and carry a dozen of its kind, but I can't say as much for myself.

FLORENCE. Just see what a load man can carry and how far. I haven't seen you carry your small load over eighty feet.

ANT. Eighty feet is 3,840 times my length. If a man is five and a half feet tall, he should be able to carry or drag his loads four miles, to equal what I do.

FLORENCE. But look at the small weight of your loads.

CECIL. I've been figuring on this. I laid the kernel of a hubbard squash seed on the ridge of our ants' yard. From two to six ants moved it a foot, and then one took it in its jaws, stood on the edge of the vertical wall by the door, and let it dangle against the side.

ANT. See? That seed would weigh thirty times as much as the ant (maybe twice that), and thirty times the weight of a man would be about two and a fourth tons. Could a man lift that much with his teeth?

DOROTHY. I fear it would pull his head off.

CECIL. I gave the ants several such kernels, and they dragged them home. One was laid twenty-five feet from

the nest. It took two days and four hours for the ants to get it home. They moved it the first foot in an hour.

DOROTHY. Did they work all day?

CECIL. From one to six ants worked mornings, evenings and nights. The trail was not smooth. In crossing a pile of stone they lost the kernel, and I helped them dig it out.

ANT. I'd like to see one man, or even six men, drag 4,500 pounds over rough ground one and a quarter miles in a little over two days.

ALBERT. Our ants moved a whole English walnut kernel four inches—the heaviest load I ever saw them move.

CECIL. The tails of five filaree seeds got tangled, but a single ant dragged the whole bunch home. Afterwards I saw an ant drag home five green ones that hadn't fallen apart yet. She must have cut the stalk off. Maybe the milk of the green seeds was for the babies.

ALBERT. What's the longest distance you ever saw one ant carry another?

KENNETH. Forty-five feet, and then the carrier lost it. It was like this. I threw some dirt on an ant. Another picked up the dusty one and started west over an awful road—no trail and plenty of stones, matted grass and weeds.

ALBERT. Anything interesting happen?

KENNETH. When the carrier laid the dusty one down to rest for the fourth time, it escaped, but went on straight away from home. I picked it up, could find nothing the matter with it, and laid it down. After it had hunted for me for half an hour I took it home.

ALBERT. Then what?

KENNETH. Three doctors stopped it and felt it over.

Two of them went away, but two more came to consult. The dusty ant lay down on its side and was given a good examination.

ALBERT. What did the doctors say was the matter with it?

KENNETH. Bad news, I guess. The poor thing jumped up, ran away, and bumped into several ants, making them open their jaws. I returned it several times, and then let it go.

FLORENCE. It must have had some catching disease. Oh, yes, maybe it had mould on it or mites. There being no pest house, the only thing to do was to carry it or drive it out of the neighborhood. It would never do to let it go into the house among 2,000 ants. You see, I've saved Cecil the trouble of explaining this.

ALBERT. What would I have to do to equal what that worker did in carrying a sister forty-five feet?

CECIL. Take a man in your teeth and carry him two and a fifth miles over stones, across logs, through brush, across canyons, and over hills.

KENNETH. I have found a Harvester trail one hundred eight feet long. Forty feet of it has been cleared of dead grass and is a fine runway. It led to a pigeon house. I guess you see why.

ALBERT. I know a colony like ours that have opened up a branch nest fifteen feet away, cleared a three-inch runway through the dead grass, and the ants pass back and forth.

CECIL. I find that our kind of ants make trails across the vacant lots around here just like we do. I don't know whether the ants really clear the trail of weeds or do as we do—wear them off.

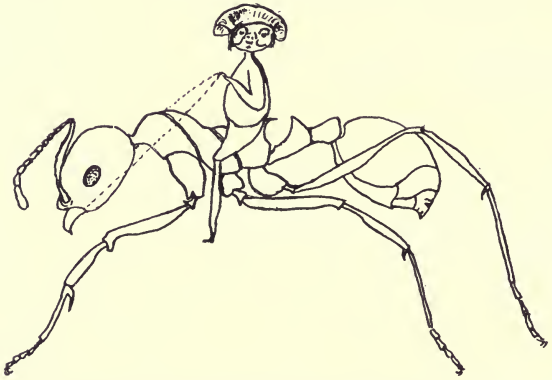
ALBERT. Maybe we can find out.

CECIL. I have beaten the rest of you. I know a colony

like ours that are going one hundred and sixty feet to their harvest field. One hundred feet is along the sidewalk. I counted fifty dead or crippled ants on that sidewalk. What would man have to do to equal this hundred and sixty foot trip for grain?

DOROTHY. You answer.

CECIL. If an ant is a quarter of an inch long and man sixty inches, he would have to travel exactly nine miles



A Brownie Going After a Load of Grain.

and bring home a mouthful of food for the family each trip—or his arms full.

FLORENCE. I guess Brownies use the ants for horses. It is the Brownies that are wise, not ants. I've drawn a picture to show you how they look. I guess no Brownie ever asks to ride behind—unless it is a good piece behind.

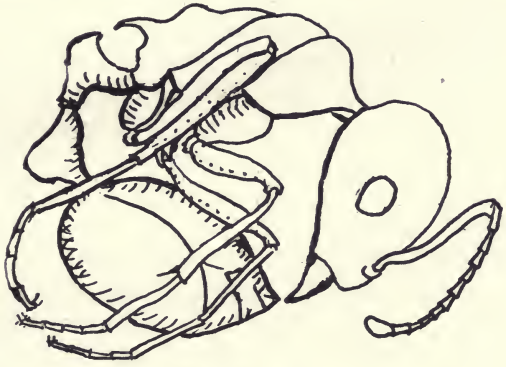
ALBERT. Your trail of ants is about four inches wide, but when danger threatens you widen it out to a foot or more.

ANT. Wouldn't your line of soldiers make some changes if an enemy appeared?

ALBERT. I notice that an ant that is being carried by another nearly always doubles up and makes no fuss. It acts like it was enjoying the ride.

KENNETH. Several times I've seen our ants carry in bits of dry leaves. They are used some way for building purposes, I suppose, to stop up earth cracks with, plaster them up, for instance.

ALBERT. An ant was taken by the feelers close up to



Position of Ant When Being Carried.

the head, and carried away back down. She must have resisted an officer.

CECIL. It is said that sometimes an ant will grasp the waist of another with its jaws and then they walk along tandem. Even a third ant may be added.

FLORENCE. Our ants were carrying home bits of broken glass this evening, a distance of fifteen feet. Come to think of it, I often carry home things that are of no account—even pieces of colored glass.

KENNETH. I know you carry out the dead, but don't you have any ceremony?

ANT. We simply carry our dead to the rubbish heap or beyond. Probably the stories about the funeral ceremonies of ants are not true.

CECIL. I saw an enemy clip the head off one of your ants. You simply carried the head and body to the rubbish heap.

Fighting, Ammunition.

KENNETH. It's wrong for us to get it into our heads that the different ants of a neighborhood are always fighting each other, with intent to kill. If I should drop one of our ants into the home of the Acrobats, they would chase her out in a hurry, but would not kill her.

ALBERT. Yes, and if I should drop an Acrobat into the home of our ants, they would pay no attention to her. Neighboring colonies know just what each other will stand and what they won't. So, they know just what they dare to do, and respect each other's laws.

KENNETH. And any ant that refuses to respect these laws is likely to lose its life, of course. We are not now speaking of those kinds of ants that live by robbery and murder, but of those that have learned to make a living in a decent way.

ALBERT. Might the acid or fluid that an ant can give off kill an enemy?

ANT. Yes, or paralyze it for a time. Why, some bugs will fight you with an odor. Haven't you smelled it? When a bee stings you, you wouldn't know it if it were not for the poison that is injected into the wound. There's nothing strange about an ant protecting itself with poison.

DOROTHY. What do you do with the eggs, babies, pupae, young wabbly ants—yes, and the kings, queens and welcome guests when the danger signal is given?

ANT. Rush them to the place of greatest safety.

KENNETH. How do you pull the legs off an enemy?

CECIL. I know. A few ants get on one side and a few on the other, and then all pull at once. Sometimes others help by cutting at the joints. They pull feelers off the same way, or simply cut them off.

DOROTHY. Which whips when two colonies have a real battle?

ANT. That's a curious question. It depends on numbers, strength, speed, courage, spirit, confidence, ammunition, strategy, patriotism, morale——

DOROTHY. Stop. I don't know what you are talking about.

ALBERT. I'm interested in boxing. If you and another ant were going to box or fight, how would you go at it?

ANT. We would be apt to face each other—heads a short distance apart. Then our feelers on the same side would be crossed; one of us would say "Ready," and at it we would go.

DOROTHY. What is your most dangerous enemy?

ANT. The most dangerous enemy of ants is ants, and the most dangerous enemy of man is man, if you don't count those that are so small you can't see them—moulds and bacteria.

KENNETH. Are big-headed ants all soldiers—all fighters?

ANT. No, indeed. Some of them can't fight at all, and just use their awful jaws as nut crackers for the whole family, or use them to break the hard shells of bugs with.

DOROTHY. What is the biggest animal ants can kill?

ANT. Pigs, monkeys, snakes, and so on. Why, the native Mexicans used to punish or kill their enemies by binding them to nests of ants.

KENNETH. I don't know whether I saw a battle today

or a tug-of-war game. It was two colonies like ours that were about twenty-five feet apart when home.

DOROTHY. How was it?

KENNETH. A few would line up on each side and pull in opposite directions. There were about twenty of such groups. They didn't seem to hurt each other. I guess it was a friendly fight. We'll have to learn more about this kind of a field meet.

CECIL. Two colonies of the same kind may have a sort of friendly fight, sham battle, or tug-of-war. Such a fight may last a month. No harm may come to either side or one colony may rob the other of its grain. The ants robbed may or may not leave the old nest. It's a little as if their grain was put up as a wager in a sham battle.

KENNETH. Do all colonies act alike when attacked in a real battle?

ANT. Oh, no. Large colonies usually fight and small ones usually run. Some play 'possum, while others leap around to dodge the enemy.

KENNETH. Then it depends mainly on the number that can be hustled together for defense.

CECIL. I can see that acid would be dangerous, but that other bad-smelling stuff wouldn't cut much figure in a battle, would it?

ANT. Then you wouldn't run from a skunk? I see that man has learned to use gas in war.

ALBERT. I'd like to see a real battle between two colonies.

ANT. Watch out and you will see us have one.

ALBERT. But I don't want to wait. Kenneth, tell us about the one you read about in Henry McCook's book on Ants. The two colonies lived under the sidewalk, I believe.

KENNETH. All right, if you will use your imagination.

Place something the ants like to eat on the pavement between the two colonies. The ants of No. 1 colony find it first. Then come the ants of No. 2 and the battle begins.

ALBERT. All right, I have the picture so far.

KENNETH. Recruits come and pile up two or three deep at the center and the mass looks like it is boiling. It is a hand-to-hand fight. Now the great mass begins to separate into groups. In all, these cover several square feet.

ALBERT. It's all right if I only knew for which side I am to root.

KENNETH. Generally one ant is fighting one, but in places it is two, three, four, five or six against one. Here several have surrounded one and are pulling its legs off, and there they are tearing one to pieces.

ALBERT. It's a battle, all right.

KENNETH. See the two standing on hind legs with jaws locked and trying to sting or gas each other. Yonder it looks like a football rush and here a tug of war. This one has her helpless enemy by the face and that one has lost her nerve, is running wild and snapping at any ant she passes.

DOROTHY. Come on, Florence; let's go.

KENNETH. Now some ants have lost a feeler, others a leg, a few have but one leg left, and some are cut in two. Still recruits come rushing in. There a line is breaking for home, but here the recruits meet and still grapple.

ALBERT. I fear you are nearing the end.

KENNETH. The center of the battle now sways toward one nest, now toward the other. At last one side seems to be winning the day. The warriors now cover a space six inches wide and two feet long. The recruits have quit

coming and the ants are going home, leaving the dead and wounded upon the battlefield.

ALBERT. I must read about that battle myself.

KENNETH. Whole legs and whole feelers and whole bodies, and all the different parts of each, lie everywhere, while ants with different lengths of stubs struggle amidst the mass, which is mainly collected in windrows. The battle is over and the dead and dying are left to the winds and the ghouls.

ALBERT. Didn't either side get the meat, or whatever it was?

KENNETH. Not at this time at least.

ALBERT. How long may such a battle last?

KENNETH. For hours, days, or even weeks, the book says.

ALBERT. I wish I knew whether or not the ants went back to the battlefield and either gathered up their own dead or that of the enemy.

KENNETH. Do you suppose ants feel pain when hurt, as we do?

CECIL. No, or they wouldn't continue to eat, sometimes after a feeler, leg or even the abdomen has been cut off. They may feel pain, but not as we do.

Heat and Cold.

FLORENCE. What do you do when your ants get too cold down in your nest?

ANT. Just like you do—huddle together. You know a room full of people will help keep it warm. A schoolroom gets warmer after the children get in. Well, when we huddle together in a small room, we warm each other and also warm the room.

FLORENCE. What about winter time?

ANT. Most ants get stiff and sluggish below sixty degrees. They eat and move about but little then. Even in southern California we don't work much in winter time. If short of food, we might go out after some on warm days.

FLORENCE. I know an ant may be frozen and thaw out and be as good as new, but how much heat can an ant stand?

ANT. This was tried by Miss Fielde, a well-known naturalist, and the ants swooned at 96 degrees and died at 112. So, if you hold us over a hot stove we die.

KENNETH. I've seen ants out here when it was hotter than that next to the ground, especially Honey ants. Lay your thermometer on the ground at noon and see how much hotter it is where the ant's head is than where yours is. When carrying out dirt in the hot sun, the ants make mighty good time in getting back into the house.

ALBERT. We seldom have a hot desert wind here, but we've been having one for three days, and you've been closing your doors at 6:30 in the morning, instead of 9:30, the usual time. During the last hot wind you kept your doors open all day.

CECIL. The speed at which ants travel depends entirely on temperature, according to Prof. Harlow Shapley of the Harvard Observatory. I think the same is true of the rate of motion of jaws and other parts of an ant—even in battle.

CHAPTER VII.

August 20 to September 5.

Food.

ALBERT. A few scouts brought home a sample of Bermuda grass seed. Then 700 started out for the harvest field. One brought in a branch that had seven seeds on it.

ANT. We like seeds best, but we bring in the bodies of many animals, also. The sow bug has a hard shell like the turtle's, and we can't capture it alive.

KENNETH. When I tried to take a large sleek pupa case away from you, two other ants helped you hold on. After I dragged it six inches you spent fifteen minutes trying to gnaw one end open.

ANT. And you broke the end open for me and I tried to crawl inside. You thought it was empty, but it wasn't, for we dragged it home.

ALBERT. Sometimes you bring one kind of seed home and sometimes another. You seem to take whichever is the handier.

ANT. Of course, we often have to take what we can get, but I think you will find we have a choice in some cases.

DOROTHY. If you are about blind, I don't see how you find such small seeds.

ANT. We use our feelers, mouth-parts, feet and sense of smell. If we had big wet eyes like yours, they would get full of sticks and dirt, and they wouldn't be of any account at night or in our dark house.

KENNETH. I've never seen one of your ants take a seed away from another and take it home to get the credit.

CECIL. I have—but only once.

ALBERT. The next day after I gave you three lumps of sugar, I saw you drag two dead queens out of the house.

ANT. Overdose, maybe. Still, we don't care much for sugar.

FLORENCE. I gave your ants too big a piece of fruit, and they buried it.

DOROTHY. I gave our ants a piece of apple. You should have seen them drink cider. In a day or two I cracked the seeds and the ants carried them into the house. Nothing was left but the bare core.

FLORENCE. When I feed the ants, I can't understand why they so often carry the food a few inches away from the door before taking it in.

KENNETH. I gave our ants a feast—a pupa, spider, and a large grasshopper. The next day they were all gone.

FLORENCE. And I served a piece of fruit, almond and a dozen insect eggs for luncheon today.

CECIL. One of ours tackled a very large fly. They cut one wing off and were working the other up and down and biting it at the base. An ant then tried to drag the body, but couldn't. Next, a queen came along and dragged it an inch. She then picked up the wing that had been cut off and carried it away.

ALBERT. I have counted the bodies of eighteen Fuller's rose beetles lying at your door. I don't see how you crack the hard shells.

ANT. I told you how we suck the juices out through holes we make at the joints, but we could also get our largest ants to crack the shells of the younger ones.

FLORENCE. You still keep a good supply of Carpenter bodies lying around your door.

KENNETH. How can I get some skeletons of the grasshopper and of other insects?

ANT. Give the insects to us. We'll eat the flesh all off and carry the skeletons out for you. Some insect collectors get ants to do this for them.

KENNETH. I gave our ants some honey, but they didn't care much for it. I then placed some on the back of an ant, and it ran into the house. I'll bet the nurses had a sweet time cleaning it up.

DOROTHY. That wasn't very nice in you.

KENNETH. I let some honey run down the sides of the doorway. The ants covered it up with sticks and dirt so they could walk over it.

CECIL. They'll cover up anything they do not want on their yard if they can't carry it away, but it is not because they want to bridge over it.

KENNETH. The ants don't like lard, so I pasted a little on an ant and it ran inside to report me. About a dozen guards rushed out and stationed themselves near the door.

DOROTHY. That is worse yet.

KENNETH. Later I gave the ants some more honey. This time I spread it on small bits of paper. That night the ants carried the pieces indoors and in three days carried them out all licked clean.

CECIL. Maybe the Acrobats visited our ants and ate most of the honey.

KENNETH. I fed all the ants some raw beef. Ours never touched it, but the Acrobats ate for fifteen minutes and the Longlegs carried theirs indoors.

DOROTHY. Ours didn't care for the milk I gave them, but they liked the sardines.

CECIL. You better quit feeding them so much or they will become as helpless as dogs, cats, horses, cows, sheep and chickens. They'll starve when you quit.

KENNETH. I have wet a piece of paper and a piece of tobacco leaf and have laid each at the door of our ants, as you see. Look! The ants like the tobacco water the better.

FLORENCE. Well, you'll be punished if I tell. Now they'll die.

KENNETH. They don't act like it, but maybe they wish they could. I've done this several times before, and they've always preferred the tobacco water but once.

FLORENCE. Did anybody but you ever find out that ants like tobacco?

KENNETH. Yes. After I discovered it, I read of a farmer near Austin, Texas, that had to hide his chewing tobacco to keep the ants from stealing it. And near the same place they stole a farmer's wheat, too. Did you ever read the story, "Then another little ant went in and carried out another grain of wheat"?

ALBERT. Ants like fats and oils. They squeeze the oil out of seed. They get fats out of game, also. Some are great hunters for live game, like some men, but more of them just gather up the dead.

CECIL. Ants are wise. Sometimes they fatten their stolen babies before eating them. Mushroom raisers enrich their gardens with liquid fertilizer and with more chewed-up leaves. Ants harden their walls with formic acid. Some kinds cover their mounds with gravel roofs. This doesn't wash off, either. These little Garden ants often cover the inner slope of their craters with small pebbles.

KENNETH. If a colony couldn't get other food, might they eat their eggs?

ANT. Yes. If a colony were likely to starve, they would first quit making any large soldier forms. Next, they would quit making kings and queens, too, except one queen. Finally the workers would die of starvation, leaving nothing of the colony but one queen. You see, there is a chance yet for the colony to be saved if the queen can get enough food to keep alive.

FLORENCE. Ants gather nuts a good deal like squirrels do, don't they?

ALBERT. Yes. For instance, father saw a bushel of nuts in the stump of a tree that had just been cut down. When the workmen went back after the nuts the next morning they had all been removed. What put them there and what took them away?

KENNETH. Have you a storage room for your seeds and babies?

ANT. Some ants have and others scatter them around on the floor anywhere, same as man. Now laugh! I don't mean man scatters his babies around.

KENNETH. I placed a piece of almond by the door, and about a dozen Acrobats came and dined with ours, although they had no invitation.

CECIL. At last I thought I was going to see our ants carry the dead body of one of their kind home for food. I uncovered the body in a cloth by the nest. The ants examined it carefully. One of them started indoors with it, but was held up by several others.

ALBERT. Go on.

CECIL. After a pulling contest, an ant took the body away from the carrier, walked away five inches, stopped to think, turned and started for the door again, where

there was another pulling match. The body was again taken away from the pall-bearer and carried in one door but out another. At this point I lost track. So I don't know what to think.

ALBERT. Look at this chaff of 15,000 filaree seed that has been gathered and hulled within the past six weeks. And we don't know how much has blown away.

DOROTHY. I wonder how our ants get along without salt.

CECIL. They don't need any. Some large animals can live without salt. The Blond Eskimos of the Arctic region have never seen many white men and never tasted salt. They live on fish, meat, entrails of birds, stomachs of deer, liver, berries and greenery of the short summer. I have read that they are the healthiest people in the world.

DOROTHY. Then the use of salt is mostly a habit. But at this place the air carries some salt from the ocean.

FLORENCE. I fed the Carpenters some fruit, but they were quite shy. A few ate while a dozen kept running round and round the fruit—on guard, maybe.

DOROTHY. A neighbor girl put a large berry into her mouth and something bit her tongue. After the lone Carpenter had captured her she captured it.

ALBERT. I saw a pup catching and eating some Carpenters. He was careful how he snapped them up.

KENNETH. An ant came home after the door was closed. I gave her a fly. She picked it up, ran back and forth past the door until she knocked it down, and then carried the fly inside.

DOROTHY. Look at this fine white sand scattered all over the yard.

CECIL. That isn't sand. It's little balls of flour that

the ants have dumped out of their mouth pouches after the food had been dissolved out.

ALBERT. I read of a fungus-growing ant that laid ten to twelve eggs a day for ten days, and nine out of every ten eggs were eaten by the mother. Later eggs were fed to the babies, also.

KENNETH. Just see what I picked up on the crater today:

21 heads of Carpenters.
19 abdomens of same.
6 bugs ⅛ of an inch long.
4 bugs ¼ of an inch long.
2 earwigs ½ an inch long.
2 sow bugs.
1 of our ants—55 in all.

ALBERT. I suppose this food will be served in the dining room as needed. It keeps better out in the sun than it would in the house.

KENNETH. One of our ants attacked a small beetle, but soon let go and began to cut up high jinks. Then another followed up the attack as the bug was running away, but got a dose of poison, too, and stopped to work with herself. A third ant was more successful, for she bagged the game and took it home.

ALBERT. The bug's ammunition was finally all gone, I suppose.

FLORENCE. You toted twelve grape seed home and into the house and the next day you carried them all out. Didn't you know you couldn't crack them? Foolish ants!

ANT. Maybe we wanted to lick the dried juice that was on the outside.

FLORENCE. Even some ants that were mining stopped

to carry them back into the house after I cracked the seeds.

ANT. Well, wasn't that all right?

FLORENCE. I dropped some Bermuda grass seed at your door, and what do you think? Hundreds of your ants walked right over it before they had sense enough to know it was the same kind they were going sixty feet for. When you get your head set, you can't change it.

ANT. You don't always see things either, unless you are looking for them, and sometimes not then. That seed didn't smell right, anyway, because you had handled it.

KENNETH. An ant combed the fuzzy hairs of a fire-



Combing a Hairy Seed.

weed seed for half an hour, stopping every ten minutes to rest. I pitied her, picked the seed up, rolled it between my thumb and finger, fixed it nice for carrying home, and gave it back to the ant.

ANT. Of course she wouldn't touch the seed, because you had changed the odor and feel of it.

KENNETH. No, although I picked the seed up on a straw and shoved it into her face several times. She just kept on hunting for her seed.

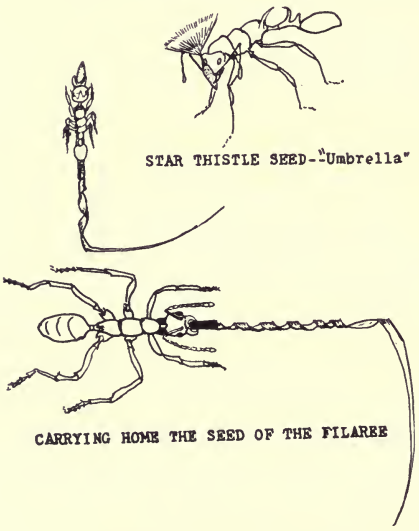
ANT. That seed is so small and so hard to carry that we don't bother with it unless food is scarce.

CECIL. A seed like the dandelion relatives or the star

thistle is quite hard for you to carry or drag. Each has about a hundred fine hairs standing out at one end, and each hair has a hundred barbs on it to catch on everything you pass.

FLORENCE. Often you take one of these seeds in your jaws and carry it as I do a parasol, over your head or in front.

CECIL. The seed of the filaree has a long tail that is



STAR THISTLE SEED-"Umbrella"

CARRYING HOME THE SEED OF THE FILAREE

twisted like an augur, and this tail ends in a scythe hook to catch on weeds and sticks.

ANT. In rain or dew this augur untwists and afterwards the hot sun twists it up again. The seed is trying to plant itself, but sometimes makes a mistake and traps an ant in its coil. The filaree is one of the best seeds, but hardest to drag.

CECIL. In two evenings' time I saw you carry out the chaff of 1,200 grains of oats.

ANT. That wasn't enough to last a thousand ants very long.

KENNETH. I placed some ginger, salt, pepper, sugar, a fly, a slice of banana and peach on your trail. The workers paid no attention for a long time, but finally tackled the fly and sugar.

ANT. Our workers seldom stop on the trail to eat.

FLORENCE. You looked like a monkey the other day when you were rolling that large pupa case home.

ANT. There's another animal that looks more like a monkey than I do.



FLORENCE. I see you can stand upright. See if you can do it and carry your umbrella.

ANT. All right. Here I go.

KENNETH. You made seven feet a minute going after some of that woolly fireweed seed, but only one foot a minute coming back the thirty feet. Another ant averaged only one foot in three minutes in bringing home a filaree seed. The augur tail and scythe hook caught on everything.

CECIL. Another one of those seeds caught and the ant couldn't pull it loose. Ant No. 2 came along, helped un-

fasten it, and then went on to the seed field. Now, what do you think of that?

KENNETH. The harvest field at the end of the trail was about three feet square this evening. As soon as an ant could find a seed it would straighten up, pause a moment, and then start the right direction for home. How did it know which way home was?

ANT. I told you we are guided by the direction of light and by the trail odor more than anything else.

KENNETH. I took a seed away from an ant and put her back on the trail. After searching a while, she went three feet toward home and then turned and went back to the harvest field.

CECIL. Florence cracked sixteen muskmelon seed for you. How long will they last your ants? I believe I can eat my weight in a month.

ANT. Oh, say a thousand days for one ant, or one day for a thousand ants.

FLORENCE. No wonder you have to hustle to get enough food for your family, is it?

KENNETH. How do you keep seeds from sprouting when you take them under ground? Man doesn't know how.

ANT. You'll find that we fail sometimes.

FLORENCE. Why do you carry out some of your seed without hulling it?

ANT. You know it may be spoiled, or impossible for us to hull it, or it may be a mistake.

CECIL. Tell us how you treat your grain.

ANT. First, we generally pile up the grain as we bring it in and leave it to go through a sweat.

FLORENCE. And what's a "sweat"?

ANT. As long as grain lies out it keeps some moisture

in it. Then if it is stacked or piled up, it gives off this moisture, or sweats. After this it is drier than before and threshes easier and keeps better. All farmers know this. After the grain is hulled we store the kernels and carry the chaff out, just as farmers do.

CECIL. I see. And if you didn't put it through a sweat before threshing, the kernels would go through one afterward and spoil. Wise, aren't you?

ALBERT. I see you wait until the grain falls to the ground before you search for it.

ANT. Not always, as you will find later.

ALBERT. We boys used to gather nuts in the east and store them away for winter, just like you do.

DOROTHY. Why go so far for seed? Food must be getting scarce.

ANT. This time of year most plants are dead, and their seeds have blown away or have walked away, or have dug or bored themselves into the ground, or have been eaten. So the seeds are hard to find, and there are but few living weeds to secrete fluids for ants.

ALBERT. I see the Carpenter and several other insects getting something off the green plants around dwellings.

KENNETH. There are only three in our family. So I can hardly imagine a thousand or two of your ants marching up to the lunch counter to eat. It must take a good deal of flour. And, since you have no colony mill to grind your seed, you have to rasp the flour off the grain with your mouth parts. Nixey on your flour mills for me.

ANT. All living things have to hustle to make a living or there will soon be no more like them. So, fossils are all that is left of many a once living race. You think your inventions (improvements) are symbols of civilization, but

they may prove to be symbols of destruction. You can't tell yet. Are you more civilized than the ancient Greeks?

CECIL. Our ants have hulled a thousand salt grass seeds and dumped the hulls out.

ALBERT. Some think that the ants nip the germ of a seed to keep it from sprouting, but I can't see that they do.

CECIL. I'd rather think they treat their grain with some fluid for that purpose. I've noticed that some of the oats kernels are ripped open down the soft side.

ALBERT. Many ants seem to depend mainly on plants for food.

CECIL. Yes. Plants produce seed, the chief food of many ants. They give ants many kinds of sap from different parts. Plant lice and scales live on the juices of plants, change them a little and feed them to ants. Plants furnish ants with water in dry times. They furnish homes for ants and protection.

Do Certain Ants of a Colony Do Certain Kinds of Work?

ALBERT. Your colony has many different kinds of work to do. Are certain ants assigned to each kind? That is, do you have "division of labor"?

ANT. We have foragers that gather food, threshers that husk it, laborers that carry out the chaff, miners that make our house, graders that shape our yard, wood choppers to clear our ground and make our trails, and——

ALBERT. Hold on! You are claiming——

ANT. We have policemen to guard our house; soldiers that are ready to fight; doorkeepers at our granaries; nurses for our eggs, babies, kings, queens and hungry workers; undertakers to care for the dead, crippled and sick, and servants to wash us and keep us clean.

ALBERT. You are claiming too much.

ANT. Why don't you wait until I'm done? While some ants have division of labor, our workers can do any of these things.

ALBERT. Well! Jack of all trades, aren't you? But when you've started to do one thing you don't like to change off to another.

ANT. Maybe we'll develop castes that can do but one kind of work each, after we've been on earth longer. But I'm afraid we shall lose by it rather than gain. Has a man gained much when he can't do anything but punch a button? Our king is a sample of a caste. Look how helpless he is.

ALBERT. Well, don't get excited.

ANT. The Honey ant has division of labor. With some other ants the occupation changes with age—nurse, forager, warrior, guard and even mother—as the ant passes from youth to old age.

The Ant Lion.

KENNETH. What's an Ant Lion?

ANT. It's a big-jawed baby of a winged insect, that makes a funnel shaped hole in sand or decayed wood for us to fall into and be eaten.

KENNETH. I suppose the sand rolls under your feet when you try to climb out. You oughtn't to kick about this, for I think that you sometimes use your crater as a trap for this same purpose.

CECIL. The baby ant lion lives at the bottom of the funnel. I saw one run its long jaws out and grab a fly that had dropped into the trap.

ALBERT. I saw a dozen such traps the other day. I

dropped a big red ant in one, but it finally escaped, although it was showered with sand by the lion to try to knock it back. I threw two small pebbles into another den and the lion thumped them out, too. She scooped the pebbles and dirt onto her shovel-shaped head with her flat forelegs and then pitched them out.

FLORENCE. What if a pebble was too big?

ALBERT. She would put it on her back and then walk out backwards.

FLORENCE. Did you give her any more ants?

ALBERT. Yes. I dropped in a smaller one and it got caught by the foot. Then I tried the little red ants and they couldn't get out of the trap. But the lion was afraid of them, and I don't blame her.

KENNETH. I know that insect, but I don't know its name.

FLORENCE. So do I. When I say, "Ooly, ooly, up the ground" several times, it comes up.

KENNETH. It does just as well to say, "Doodlebug, doodlebug, come up, come up, come up."

FLORENCE. Tell me more about this lion.

ALBERT. Ants dread it worse than you do a real lion. There are three hundred kinds. They live for a few months, but if food is scarce it may be three years. The depth of the trap depends on how far the particular lion can throw dirt. Later it grows wings and looks like a small snake feeder.

The Blood of Ants.

CECIL. Why is it I never see any blood in an ant?

ANT. Because its blood has no color. An ant has blood,

a heart to pump it, about twenty breathing pores in its body, and it has everything else that it needs.

An Ant Has No Special Friends.

FLORENCE. I have a few good friends. Show me yours.

ANT. I haven't any particular ones. All our ants are alike to me. I'd divide my dinner with one as soon as another.

CHAPTER VIII.

September 5 to September 15.

A Visit to the Ants in the Evening.

KENNETH. Well, here we are with our flashlight at eight o'clock in the evening. About 200 of our ants are walking around over their premises doing nothing.

ALBERT. Watch half of them hike into the house when I blow my breath on them gently.

KENNETH. These two ants have been biting the body of a dead Carpenter for five minutes, and now one of them has picked it up and carried it to the door and back again.

CECIL. Yes, and now another carries it to the door again, then east five inches, and now back and west five inches.

DOROTHY. They're just trying to fool you and you'll never see them take it into the house.

CECIL. Not so fast. Look! After another journey the body is carried straight into the house. We have been trying to catch our ants doing this trick for over a month.

DOROTHY. Here come six queens out of the house. The other ants pay no attention to them. They have divided into pairs and walked to the top of the ridge.

KENNETH. Look! They all became frightened and ran into the house at once, but two have come out again.

DOROTHY. Well, never mind the queens, but look here. This big Carpenter has searched all over two sides of the yard, and is now trying to pull the body of a dead sister

loose from the ground. I suppose the body is to be taken to the Carpenter home for a more decent burial.

KENNETH. Wrong again. It has carried the body right up to the door of our ants and left it. Strange, isn't it? And now it has carried a clod six inches away from the door.

DOROTHY. No wonder our ants like the Carpenter if it carries food and clods for them—works for them. Why, I don't believe it would do that kind of work for its own colony—at least, not in that way. It is trying to do like ours.

KENNETH. This Carpenter is now walking around over some of our ants while others walk up to it, face to face, but with feelers well laid back. Now it has stopped in the rubbish heap to eat a piece of fruit.

DOROTHY. You have given us a very good show tonight. I suppose you have a fine one every evening. We must go now. Good night.

KENNETH. Say, wait a minute. Do ants ever dream?

ANT. Do dogs?

KENNETH. Well, pleasant dreams.

ANT. Thank you. Here are passes to our show for tomorrow evening.

* * * * * *

DOROTHY. Hello, Ant, good evening. Here we are again. Hope you will put on a good show like you did last evening.

ANT. Glad you are here. About 200 of our ants are loafing around on the yard, while a number of foragers have gone out in two directions and soon ought to be bringing something home.

KENNETH. Look at that ant carrying the body of a big Carpenter to the top of that tiny post on your yard.

ALBERT. A half dozen of yours have taken turns carrying the body of another Carpenter around here.

DOROTHY. Why don't they take it indoors, or to the rubbish heap, or eat it, or do something with it, or let it alone? They make me nervous.

ANT. They'll take it indoors when they get ready.

KENNETH. I'll take the body away from them. There, one grabbed it and took it into the house.

CECIL. Here lies the body of the biggest Carpenter I ever saw. I'll watch and see what you do with that.

FLORENCE. I have here a pound of raisins, and I'll give you a few bits for letting us in free.

ANT. It smells good, but we don't care much for raisins. Look out for the Carpenters now, for they will smell the fruit and rush this way.

ALBERT. Aha, here comes one now. Just see her! She is excited and is trotting all over our ants, knocking them down, snapping at them, and acting half crazy.

FLORENCE. I'll give her a whole raisin and see how long it takes to eat a meal. It is now six-thirty in the evening.

KENNETH. Come out here to the trail and see this large, hard, sleek pupa of some insect. The ants can't get hold of it, but have worn a pit a quarter of an inch deep trying to.

FLORENCE. Why don't you help them?

KENNETH. All right. I'll tie this thread around it for a rope to pull by, carry it nearly home, and let the ants drag it the rest of the way by the rope. Look! Four of them are riding on the pupa as I carry it.

FLORENCE. What did your ant do with the body of the big Carpenter she carried to the top of the post?

KENNETH. You yelled for me to look at something

else and I forgot to watch. I've lost it. I can't see a dozen things at once.

FLORENCE. Where is your big insect pupa with a rope tied to it?

KENNETH. I declare; it's gone, too. The ants must have pulled it into the house by the rope, because they couldn't do it any other way.

ALBERT. Too many things going on around here at once. We can't see them all. It's better than a three-ringed circus.

ANT. Well, you asked for a good show, didn't you?

KENNETH. See this big headless grasshopper I threw down by the door. A dozen ants are biting him. See him kick an ant three inches. There go two others four inches, and there goes one a foot bang up against a stone. Ha, ha, ha!

FLORENCE. That's nothing to laugh about.

KENNETH. Grasshoppers do a lot of harm.

FLORENCE. Why is this ant bringing a piece of egg-shell home a distance of fifteen feet?

ANT. Maybe there's some dried egg on the inside.

DOROTHY. I saw my cat eating egg shell this morning.

FLORENCE. It has taken the Carpenter just one hour to gorge herself with that raisin I gave her. Her abdomen is stretched until the plates have pulled apart, showing the white elastic bands that connect them.

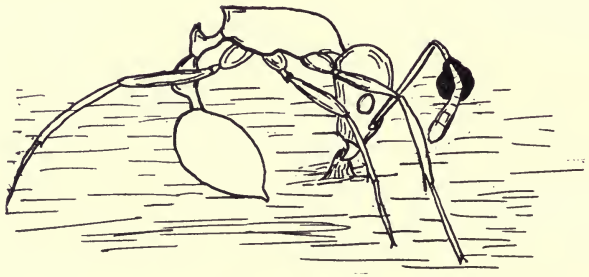
CECIL. Only a few of our ants stood beside the Carpenter while she was eating. She is chasing them away now.

DOROTHY. The body of that awful big Carpenter that Cecil spoke of is still lying here. Our ants haven't touched it.

CECIL. Yes, but look! One of ours has held her head

up against the body for a minute, and has now moved away a half inch. See, she has doubled her abdomen under her fore parts for a fulcrum and tries for five minutes to pull something out of the ground.

KENNETH. And now she has got it loose, carries it over to the head of the dead Carpenter, drops her load, moves her fore parts up and down for a minute as if weeping, turns around, walks away one inch, and—she has fallen over dead.



The Ant That Fell Dead.

ALBERT. Give me that microscope and hold the flash-light. Aha! This explains the death. The head of an Acrobat is hanging to one of her feelers. The jaws pinch the feeler with a death grip.

CECIL. Might as well pinch the brain as a feeler. Our ant must have gone to the dead for help or sympathy, or something in her distress.

KENNETH. Well, scouts, we've had another fine show tonight.

FLORENCE. I don't like tragedy. Eight o'clock. Time to go. Good night.

Eggs, Babies, Pupae.

DOROTHY. Do your queens sit on eggs to hatch them?

ANT. No, but the queens of some ants do.

DOROTHY. Could I take care of a bunch of eggs and hatch them?

ANT. I'd like to see you wash them and pack them around for a month. You'd have to keep them coated with saliva, too, or they would spoil.

DOROTHY. Then I'll try to feed and raise the babies.

ANT. You couldn't bathe them and keep the drafts, temperature and moisture right.

DOROTHY. How long does it take to feed a baby?

ANT. Oh, from a few seconds to thirty or more—owing to how hungry it is and to what we feed it.

FLORENCE. Your babies must take cold awful easy, you shift them around so much. You are always moving your eggs, too.

ANT. Think of your own baby at home. Yes, and of that incubator, if you ever took care of one.

FLORENCE. How does the pupa get out of the cocoon after its legs are done growing and it is ready to be a real ant?

ANT. The nurses cut the cocoon open, lift the young ant out, strip off its thin sheet, if it have one; straighten out its legs and feelers; feed it, and take the best of care of it. The hairs on the pupa often help work it out of the cocoon.

DOROTHY. But suppose it is a kind that has no cocoon, like yours?

ANT. So much the easier. The baby changes to the pupa and the pupa to an ant, and that's all there is to it.

Queens.

DOROTHY. You say the queen loses her wings after her first and only flight. How does she get them off?

ANT. Pulls them off with her legs and jaws, or rubs them off against something.

DOROTHY. After her wings are off—then what?

ANT. Let Kenneth read.

KENNETH. "Before taking flight, the queen has eaten much and stored away enough food to last her many, many days or even months. She generally lights, removes her wings, walks off alone, digs a hole in the ground or under something, enlarges the inner end of the hole a little for her small house, and then shuts the door up tight."

CECIL. She mines her house all alone. Often she wears out her jaws, rubs off her hairs, scratches her polished body, and is a sorry sight the rest of her life, the books say.

DOROTHY. That's interesting, if not beautiful.

KENNETH. I'm not done yet. "In that little house, all alone, with door tightly closed and no food to eat, she passes weeks or months before she lays her eggs. Then she has the care of the eggs until they are hatched and of the babies, with no food for herself or children until they are grown up, except what was stored in her body." Busy? I should say she is.

FLORENCE. That's worse than hoeing beans.

ANT. Sometimes it is ten months after she leaves the old home before the children in the new one have grown up and are ready to help her and to help themselves. The Carpenter and nearly all northern ants follow this method of starting a new home.

CECIL. As this queen will never have to start another

new home, she will never have such a hard time again. She will have servants to attend eggs, babies and herself, and she will have nothing to do the rest of her life but lay eggs.

KENNETH. After the queen gets her new colony started, what would she do if you took all her workers away from her?

ANT. Lay more eggs and start a new colony.

FLORENCE. Where does the queen store all the food you talked about—in her craw, I suppose?

ANT. No. Look at her large, powerful shoulder muscles. Food is chiefly stored in these. Later, when this food has been used up, air takes its place.

FLORENCE. No wonder the nurses take such good care of the old queens.

DOROTHY. How does it come that when I drop a queen, she can't fly?

ANT. Just before she takes her flight, she is heavy, and often would sink in water. So she can't fly until she gets ready.

FLORENCE. I suppose that some queens that fly away to start a new colony have hard luck.

ALBERT. Let me read to you about that: "Very few out of many thousand succeed—only the strongest, wisest or luckiest are likely to succeed. Many perish from drouth, moisture, heat, cold, parasites, insects, or because they did not store enough food in their bodies to last them through the starving time."

KENNETH. I found a winged queen today and gave her to your ants, but they wouldn't have her. Six of them examined her, bit her wings, and then started to carry her away.

ANT. Even if she had belonged to our colony, our ants

would hardly have let her come back unless they were out of queens.

FLORENCE. Your queens are one-half longer than your largest workers and have wings one-half longer than their own bodies, but how about queens of other ants?

ANT. The queens of some ants are much smaller than the workers, while those of some others are so large you wouldn't know what they are. Small queens sometimes lay their first eggs in the old home.

KENNETH. Some people say that small queens may take a part of the old colony along when she leaves to start a new home. You know, the queen bee does this.

ALBERT. Where does a queen make her first nest?

ANT. In many cases a queen makes her nest in sand or soft earth, or finds a suitable earth crack, or gets under a stone, or under the sidewalk. Yet, sometimes she has hard mining to do. Generally she goes down only two or three inches.

FLORENCE. If a queen should lose her wings before flying away, would the workers drive her away, anyhow? We thought your ants did.

ANT. Oh, she might be readopted and be permitted to lay her eggs in the old nest and continue to live there. You see, that some colonies have been known to use the same nest forty years and new queens would have to be gotten, either from their own colonies or from others. They would prefer to adopt a queen from another colony.

DOROTHY. I saw one of your ants drag a winged queen out on her back by her front legs. After an effort, she turned over and ran back into the house. Then she walked out herself, but again went back.

FLORENCE. How long could a queen go without eating

when she leaves home and shuts herself up in her cave to found a new colony?

ANT. The greater part of a year, and the large workers can go almost as long—say, seven to nine months.

FLORENCE. That's nothing to brag about. "Popular Science" says Anna Garbero lived 32 months and 11 days without taking food or drink of any kind.

DOROTHY. I saw one of your wingless queens at work today. She was busy on the second relay carrying out chaff. I could see the scars where the wings had grown. I have never seen a finer looking ant nor one of yours with sharper teeth.

CECIL. I've seen our winged queens at work, but not the wingless ones.

FLORENCE. I think your queens are very beautiful, with their gauzy wings one-half longer than their slender, shapely bodies. I saw one at work. She moved an earth pellet from one side of the yard to the other, and then carried some seeds into the house.

ANT. She was setting a good example.

FLORENCE. A light breeze caught her wings several times and tipped her over. I picked her up, examined her, and then let her fall, but she couldn't fly.

DOROTHY. You said queens differ in size.

ANT. Yes. Some queens are larger than others, even in the same colony. An ant colony is made up of kings, queens and workers. A few odd kinds seem to be combinations and parts of these. Of course, ants have their dwarfs and giants, the same as man has.

DOROTHY. I saw a queen carry out several loads of dirt today after all other ants had quit on account of the sun. It was eleven o'clock when she stopped. The workers quit at nine.

CECIL. One of your ants found the body of a queen sixty feet from home. I tried to take it away from her, and pulled the body in two. She took her half on home and I delivered mine.

ALBERT. I saw a queer thing this morning. An ant brought out a wingless queen by the leg. I carried her back to the door. She turned and went up the trail twenty-five feet, meeting many workers. One of them caught her by the leg and held her a while. Then she went on to where Kenneth was.

KENNETH. I had a queen treed on a little stick eight inches high. One of our ants was holding her by the leg. I laid them both down on the trail.

ALBERT. Yes, and by that time my queen had come up and tackled yours. Mine soon got yours by one leg and your worker still held onto another leg. So your queen was in a bad fix.

KENNETH. Of course, that wasn't fair, so I pried the jaws of the worker loose and then the jaws of your queen. Both queens then started off searching under stones, going into holes, and so on, as if trying to find a good place to start a new home. Both were fine looking and had good teeth.

ALBERT. It looked like my wingless queen was forced away from home. You will notice that the queens fought each other. Sometimes two queens will go into partnership and build a new home together, it is said.

CECIL. With a few kinds of ants the kings have no wings, and with still fewer, the queens have none.

ANT. Any colony of ants does not have the same number of kings and queens. Many of one and few of the other is the rule. In the same neighborhood the kings

and queens of the same kind of ants are likely to swarm on the same day—even at the same hour.

CECIL. We didn't catch our kings and queens swarming this time, if they did so, but we saw several leave home on foot, and not on the same day, either. It took this colony of Acrobats two days to get done swarming.

DOROTHY. I see a lot of kings and queens all around here on the ground. I suppose they have swarmed.

CECIL. One day I saw thirty of our ants elbow two of our queens back into the nest. Swarming time hadn't come yet. The workers seem to set the time for swarming.

ALBERT. Is it true that history names dates when there were clouds of kings and queens in the sky?

CECIL. Yes.

KENNETH. I read that sometimes the queens of certain ants will enter the homes of other kinds, kill all of them, take charge of the babies, and thus have a new colony of workers and servants or slaves, without bothering to build new homes and without the danger of a starving time.

ALBERT. When their own children grow up and the captured ones die off, the newcomers will have colonies of their own kind only.

FLORENCE. Why did you carry a pupa queen out today—the one that hadn't unfolded her wings yet?

ANT. Because there was something the matter with her.

DOROTHY. You must have pretty smart nurses to be able to make either workers or real queens out of babies, just as they please. I suppose a difference in food and care does the business.

ALBERT. Some say that small workers may come from the first eggs of a queen and so may be half-starved

when babies, or they may hatch in late fall or early spring, when food is scarce.

ALBERT. I caught a queen, but none of the workers missed her. She was so strong that she pulled one of her wings off while I was looking at her wonderful shoulder muscles.

DOROTHY. Now she can't fly, and maybe blood poison may set in.

ALBERT. I saw her, or another like her, at work for several days after the accident, and later found the body in the rubbish heap.

FLORENCE. Of course, the queen selects the first home, but who selects the homes when ants move?

ALBERT. The workers, of course. Since some ants send out scouts to search for food, I don't see why scouts couldn't select a place for a new home.

FLORENCE. I can easily see the small eye in the center of the forehead of one of our queens, but the two that are a little higher up look more like scars to me.

CECIL. Once I saw one of our queens that was lopsided and another one that had lost some of her wings—or else she never had the right number. I wish I had examined more closely. Maybe these were some of the strange forms that certain ants have at times.

FLORENCE. I know there may be many winged queens in a nest at the same time, but they will fly away. How about the number of wingless queens in a nest—the kind that have shed their wings and will not leave their old home for new ones?

CECIL. There may be as many as fifty of these. But even if a colony should lose all their queens a worker could lay eggs, and they might hatch, too.

CHAPTER IX.

September 15 to October 18.

Kings.

KENNETH. I see many dead kings around here lately. I suppose that is because they all die as soon as they take their first flight.

ALBERT. Why do you say so little about your kings and so much about your queens?

ANT. Because there is nothing to say about the kings. Notice what Kenneth just said. Queens may live for years after taking their first and only flight, and go on laying eggs and governing colonies.



King of Black Harvester Ant.

ALBERT. I think you might at least say that kings have good eyes, good eyesight and good feelers. With their three small eyes on top of their heads, they are supposed to see things close by.

CECIL. Our workers carried out four kings this morning. They were all alive, but only one could walk. A worker tried to cut or break a wing off one of the kings.

KENNETH. How did the four kings look?

ALBERT—I saw them.

Abdomen—Of three, caved in.
Five plates on top instead of four, as workers and queens have.
As large as thorax and three times as wide as head.
Head—Laughably small.
Wings—One cut off.
Muscles large.
Looked frail.
Legs—Looked weak and small.
Feelers—Part between elbow and head, quite short.
Mouth—Parts were large and hairy.
Side Jaws—Long, slender, toothed, hairy, weak.
Eyes—On sides of head—large, bulging.
Three on top of head—black, shining, bulging.
Mustache—Right decent.
Color—Black.
Spines—None on back part of thorax.
Hair—Plenty all over.
Most noticeable feature—Tiny head.

FLORENCE—From the small size of his head, I suppose the king doesn't do any worrying or even any thinking. He leaves that for others to do. No wonder the queen has to raise her first children all by herself and then govern a colony for a life-time without his help. But there's one thing—he never bothers his head or hers as to how she does it.

DOROTHY—What became of your four kings?

CECIL. None of them lived over five hours.

ALBERT—Don't forget that kings have fine eyes and feelers.

FLORENCE. Yes, but they are short on brains. They are stupid. They don't know a friend from an enemy, and can't even find their way home when they get off the

crater. Why, kings can't even engage in battle for pastime.

KENNETH. I'd as leave be a jail bird as either an ant king or queen. Nothing to do, nowhere to go, and shut up in a cell room much of the time. I'd rather raise beans.

FLORENCE. You've forgotten that the mother of a new colony is builder, feeder, nurse, warrior, and everything else until her first children grow up. She works hard enough to suit anybody.

ALBERT. But I fear it's all in your mind about queens governing. Very nice to think about, that's all. They just lay eggs. The colony governs itself. Our President has much more to do with ruling than a queen has.

FLORENCE. I guess you boys don't know that all worker ants are also females. Don't they make a success of everything? No tramps, no spendthrifts, no misers, no rich, no poor—good home makers, good nurses, good providers, and good defenders of home.

DOROTHY. This shows that females can govern, raise a family, fight, and do all the work besides, and make a success of it all.

FLORENCE. Can you imagine a lazy, brainless king taking care of eggs and babies? Why, he's as helpless as a baby himself.

KENNETH. How do you know that a worker is a kind of queen?

FLORENCE. Because it is. Workers lay eggs, too, once in a while, but often the eggs don't amount to much. Some think that kings are hatched from worker eggs—even think that the smallest workers of a colony are hatched from the eggs of workers. Now, what have you got to say?

CECIL. No wonder women want to vote.

ALBERT. Neither kings nor queens have an easy life. At swarming time the wind often blows them into water. Small lakes have been covered with their drowned bodies. Kings live only a few months, generally, and queens that try to start a new colony nearly all die.

FLORENCE. With certain ants, the mother ant knows enough to take some mushroom seed (spores) or stalks with her when she leaves home to start a new colony. She raises mushrooms to help her and the babies over the starving time.

Government.

DOROTHY. Looks like we better find out something about the government of ants. You see our government defends us and sends us to school so we can learn something.

ANT. Maybe man will be born so wise he won't have to go to school after he has been on earth as long as we have. Our ants go to work pretty young and do the work well from the beginning.

DOROTHY. Well, you've seen us children at work in the bean patch, haven't you? Don't we do it well?

FLORENCE. If you have such good government, I should think so many ants wouldn't lose their lives.

ANT. Maybe you don't know that, in some places, one grown person in every eight that die meets death by accident. That's as bad as ants.

FLORENCE. Well, how about your government?

ANT. We have a queen and you have a king for governor.

ALBERT. You've not heard of our Amazons.

ANT. Yes, but that's a myth.

ALBERT. What do you call your kind of government?

ANT. It is Anarchistic Socialism in form.

ALBERT. I know as much as before I asked.

ANT. Well, each ant does its part willingly, correctly, honestly and without fear of law or ruler and without any use for law except custom. In a way we have good government with no government. When everybody obeys the law, you don't know there is a law.

ALBERT. Don't you have to learn how to do it, and don't you know why you do it?

ANT. No, to both questions.

ALBERT. We know so much we have to have government to settle our quarrels.

ANT. Still, our government isn't so different from yours.

ALBERT. I know we have a President, but have never seen him. I have read and heard about him.

ANT. And I know we have a queen even if I have never seen her. I know her by the queen odor. We all know when she is in the house. Without her we should soon have no colony.

ALBERT. I see.

ANT. When she is present we work for her, but not because she drives us. She stands for our government. We know what to do, how to do it, want to do it, and do it, when we have a queen.

ALBERT. That's about the way we do. Our President stands for our government, too. We feel his presence, although we have never seen him; love him, obey him, even die for him (the government), just as you would for your queen.

ANT. I know our queen through the queen odor. You

know your President through talking, reading, hearing and thinking. My queen does not drive me nor your President you. We do right because we want to, not because we are driven. So do most of you.

ALBERT. You're about right.

ANT. If we should lose our queen we would all know it at once. If you should lose your President, you would all know it at once. We would adopt another queen if necessary, and you another President.

ALBERT. Right again.

ANT. I feel the presence of my ruler the same as you feel the presence of yours. Patriotism moves us to support our queen, and you to do the same for your President (government).

ALBERT. Without patriotism we would have no nation and without it you would have no colony, if I understand.

ANT. Neither of us had to learn to be patriotic. We've both lived on earth long enough to inherit that feeling. Young ants and people are as patriotic as older ones—sometimes more so.

ALBERT. But your government is in your mind and ours in books.

ANT. Wrong. Our government is in the minds of our ants, and your government is what is in the minds of your people, not what is in law books. You can't enforce a book law very long, unless it becomes a mind law. Animals that obey law live, those that don't die.

ALBERT. Well, it will be a long time before man can have such a democratic government as yours—everybody do right because he has forgotten how to do any other way. But I think we understand each other better now.

FLORENCE. Well, I don't think I know what you've been talking about, although you've repeated about every-

thing you said. You see we can learn and you can't—that's the difference.

ANT. I can learn—can improve a little.

FLORENCE. You should learn to trade and to use money. Then you could sell some of your grain and buy clothes, purchase fancy food, hire a trap-door spider to build your house with a real door, buy more acid to fight with. You could get a blacksmith to nail iron claws on your feet when yours wear out, and put iron teeth on your jaws for mining. Oh, you could do a lot of things.

ANT. Aren't we lucky not to need money? Does man ever worry because he hasn't enough? We don't. Why wear so many clothes when you don't need them? Why not build your own house? And haven't we enough to eat?

FLORENCE. Well, you'll never be smart until you learn to trade and to use money.

ANT. You see that man is such a new animal—the last one that was made—we are afraid to adopt his ways. It took us millions of years to learn ours. Wait a couple of million years and see how you stand then. "Go to the ant, thou sluggard; consider her ways, and be wise."

The Horned Toad.

KENNETH. I placed a small horned toad near your door and he played "'possum" until an ant clasped his soft throat. He then scampered away with the ant still holding on and several others running over his back.

ANT. He generally tries to keep his throat hidden from our jaws.

KENNETH. When out in the mountains I saw the big red ants dragging a small horned toad into their nest.

CECIL. Lately I've seen some little undigested cylinders

lying around your door. They were three-eighths of an inch long and one-eighth across. They included the skulls of thirty of your ants and three Carpenter heads.

ANT. You know that South America and Mexico—yes, even some of our states—have their ant eaters.

CECIL. I'll bet it is the horny toad that comes around here. You know, it isn't a toad at all, but a lizard, and small lizards eat insects.

KENNETH. Why, at the rate of thirty a night it will soon swallow your whole colony, if you don't watch out.

ANT. Looks like we might need your help.

KENNETH. I left a horny toad near your door. The ants passed its nose and carried loads across its back with-



Ants Taking a Ride on a Horned Toad.

out paying the least attention to it. Neither did it eat any of your ants.

ANT. Maybe our ants have something to learn yet.

KENNETH. I opened Horny's mouth and dropped one of your crippled ants into it. The toad got bit and gave us a lively show. He danced, shook his head, tried to rub the ant off on the ground, but finally swallowed it.

FLORENCE. Aha! I told you Horny would get you. Yesterday one wriggled around and made a little pit to

hide in just over the dirt ridge you built around your door. Then it poked its nose over the top at two o'clock and waited for your ants to come out at three.

KENNETH. And two feet from little Horny I found one undigested pellet that included thirty heads of your ants, and another thirty-five. These pellets were larger than the ones we found the other day.

ANT. What'll we do?

FLORENCE. Stay in the house when he is around. If we find him we'll carry him so far away he'll never get back.

ALBERT. Say, Ant, you have a great many things to do and a great many dangers to meet, don't you? Your work, trials, dangers, accidents and so on require that you be wise and keep busy.

FLORENCE. Well, another day is here with another bad report. I counted six horny toad pits in the soft dirt over the ridge on your yard. But we counted 950 ants on the trail, so you haven't all been swallowed yet. If Horny doesn't get indigestion you'll not have to make your house any larger, will you?

DOROTHY. People that are bothered with the Argentine ant ought to import horny toads, each to eat 240 of these little ants at a meal.

ALBERT. Too much bother for Horny to catch that many ants. Anyhow, that ant has too much ammunition to suit him, maybe.

ANT. Did you ever see the horned toad catch any of our ants?

DOROTHY. No, but I think I know how he does it. He gets on the soft earth pellets just over the ridge of your yard, wriggles around until a little pit is made for him to lie in, places his mouth at the rim of the little pit he is

in, and licks up ants as they attempt to pass his mouth, or as they are hunting for the enemy.

FLORENCE. He digs a pit so we can't see him, lets the soft under part of his head rest on the ground so you can't bite it, and so his mouth will be just even with the ground, ready to lick you up.

CECIL. He doesn't care how much the ants run over his hard back or how much they bite it. He is just the color of the dirt around him. Even we can hardly see him unless he moves.

FLORENCE. At two different times I've seen my cat eating horny toads.

CECIL. I suppose that snakes and sea gulls eat young ones, but the horns on the back, sides and head would make pretty rough swallowing.

ALBERT. Maybe these toads get on the trails, and that may account for our ants changing their runways so often. We've been thinking this was done to find a better harvest field.

CECIL. I think I see now how our ants so often get their legs and abdomens cut off. Horny is afraid of being bitten and so licks and snaps at the ants, often crippling them instead of killing them.

ALBERT. The toad's jaws are very hard and sharp along the outer edges, and could easily cut an ant in two. Our ants carry out the crippled and sick nearly every day. Harvesting must be rather dangerous business.

KENNETH. Well, I've been making a collection of those pellets and counting the skulls in them, and this is what I have to report:

Date.	No. Pellets Found.	No. Heads in Pellets.
Aug. 29—1		30
Sept. 19—1		0
Sept. 23—1		30
Sept. 24—2	(35 and 26)	61
Sept. 25—2	(7 and 33)	40
Sept. 26—1		17
Sept. 27—2	(16 and 19)	35
Total—10		213

DOROTHY. I like little Horny, but that's an awful report against him. Looks as if our colony wouldn't last long.

ANT. Here comes Florence running. She's always either good or bad news.

FLORENCE. I came—I came here at 3:30, expecting to see our ants out, but not one was in sight. But what do you think? I found Horny lying in his little pit, waiting for our ants.

DOROTHY. Why, look! Here are six of the little pits on the yard now.

FLORENCE. I picked Horny up; found he was two inches long; thought he was big enough to get along without his mother, carried him a hundred feet out the alley, and lost him in the brush.

ALBERT. I wish you had carried him that many miles away.

ANT. Horny works so quietly that he may get a good many of us before we know he is around. Besides, when we do find an enemy we are not likely to run but to search for it or tackle it, and this would give him a better chance than ever, as we can't get at his soft throat. But we are getting onto his schemes, I think.

CECIL. I see that some of the pits are larger than others. We better look out for Horny's older brothers, and maybe his mother.

* * * * * *

FLORENCE. Good morning, Ant. Listen! I've got something to whisper to you. I was here early this morning, but not one of your ants was out. It was a good thing, for three horny toads lay buried on your yard waiting for breakfast. I carried them four hundred feet away and left them near another colony like yours.

ANT. Only that far?

FLORENCE. I wrote "Florence" on their backs so I can tell if they return. They would make fine pets. They looked so nice I didn't want them to starve. Here come the boys.

ANT. Say, boys, Florence found three more horned toads on our yard.

BOYS. What did you do with them?

FLORENCE. None of your business.

ALBERT. Well, you needn't get spunky about it, for I've found out, anyway. I found them down by the sidewalk colony. Just like a girl! She took them away to save our colony, but left them to eat another.

FLORENCE. How do you know they are the same toads?

ALBERT. Because "Florence" is printed all over their backs. They are eating those ants, too, for I counted forty-five skulls in some pellets near the door.

FLORENCE. I'll move them as soon as I can find a place to take them.

ALBERT. A lady that lives out on the plains told me that she stakes out horned toads by the ants' nests. I guess you see why.

KENNETH. I found a horned toad buried in the crater of the Honey ants. That toad often hides in the weeds near the nest. When the ants come near it they are often greatly frightened and run up the dead weeds and keep quiet.

CECIL. Then they will come down the weed and run to the next one. And so on until they get home. At such times they remain quiet on a weed—will even let me pick them off, even if they are the wildest ants around here.

KENNETH. They act the same way when we come around, too. I suppose little Horny darts his long, slender tongue out and captures passing ants as quickly as you can wink an eye. As he makes no noise, he must be a dangerous enemy.

CECIL. One day I stood Horny on his head in the door of the ants and he remained quiet two minutes. Strange, but the ants climbed over him or squeezed past his head and never got scared until I removed him. I'll carry him away and leave him in a garden.

KENNETH. Ants are always surprising us—always giving us a problem to work out. I guess that's why we like to study them.

ALBERT. Strange we can never really catch Horny eating our ants.

FLORENCE. No, but George Aker, one of our schoolmates, did. George laid a small one on a crater alive with ants. The toad ran and hid, but soon returned and licked up many ants.

DOROTHY. Yes. George said its tongue seemed to be two inches long and moved so swiftly the eye could not see it, but you could see that an ant had disappeared.

KENNETH. Once I saw a real toad lick up a trail of

gnats that were passing up a wall. The insects seemed to evaporate near the end of the toad's nose.

A Colony of Black Harvesters Move.

ALBERT. That colony down under the sidewalk moved today.

FLORENCE. Oh, tell us how they looked. You know, they are like ours.

ALBERT. I counted 1,400 of them on the trail at one time—700 going each way. A few were carrying seeds, some babies, others pupae, and a few toted young white ants. All but seventy walked along as guards, and half a dozen of these would grab my finger whenever I placed it on the trail. Their bite would hurt, too. So the younger, sharp-toothed ants must have been serving on guard duty.

DOROTHY. How far did they move?

ALBERT. About forty feet to an abandoned nest on top of a hardpan knoll. Getting ready for the rainy season, maybe. The sidewalk would be a poor place in rainy weather.

FLORENCE. Didn't they carry any eggs and queens?

ALBERT. I guess I was too late to see these.

CECIL. Were there no slackers—none that refused to help move?

ALBERT. About thirty ants wouldn't go. Some walked off in the wrong direction. Later, I suppose these would be gathered up and taken by force, for that seems to be the custom with ants.

DOROTHY. How many babies and pupae were moved?

ALBERT. I couldn't wait to see or I'd be late to school, but I counted seventy babies and pupae on the trail at a time. I think it took half an hour for a round trip, and

I happen to know that it took over two hours before they finished moving.

DOROTHY. The ants are not foolish enough to take all their young out on the trail at one time, and I see why. What if some enemy should appear on the trail of movers?

CECIL. You say there were 1,400 ants on the trail and seventy of these carried babies and pupae. The seventy baby and pupa carriers, then, had 1,330 guards, or nineteen guards for each baby and each pupa.

ALBERT. That's about right, for only a few carried anything else. I think there were about as many ants not on the trail as there were on it, for I know something of the size of that colony.

FLORENCE. How did a carrier hold a baby?

ALBERT. It carried the baby, head in front, back down, and most of the pupae and young white ants the same way.

KENNETH. In what way did they most remind you of man?

ALBERT. They had their objectors and kickers. About half a dozen ants were carrying the babies back to the old home, while seventy were carrying them to the new. Six thought the old home good enough for the rainy season, and they weren't afraid of toads. No, sir; they weren't afraid of anything.

KENNETH. Why didn't the ants punish the kickers?

ALBERT. I don't know, unless it's because the ants are like men.

Our Harvester Ants Move.

FLORENCE. Ant, what makes you so still? You look like you would cry if you had any tears. We have all noticed that you have been acting so queer lately. You

don't even clean up your yard any more. You've quit harvesting—won't even eat what I give you.

ANT. I've nothing to say. Good night to you all.

* * * * * *

ALBERT. Good morning, everybody. Hear ye, hear ye! The Bean Gang will come to order. A special meeting has been called. We have very sad news for you. I came early this morning, but only to find that our ants have moved, and that all is quiet about the old home. While there may have been no deaths, we all feel as if we had lost some dear friend. As soon as you can speak, I'd like to have a few remarks.

FLORENCE. Maybe, maybe, maybe it's our fault! We fed them too much.

DOROTHY. Maybe too many got killed in crossing the alley. Maybe——

KENNETH. Maybe the mites got so thick in the nest the ants couldn't stand it.

DOROTHY. Maybe they ran out of grain.

FLORENCE. Maybe we bothered them too much.

KENNETH. Maybe this is just the time for them to move. But this was a good home for the rainy season.

FLORENCE. Maybe they got word that enemy ants were coming to attack them.

DOROTHY. Maybe some one has poisoned them.

FLORENCE. Maybe they have just hidden down in the nest.

DOROTHY. Maybe the horny toads ate them.

CECIL. I'd suggest that we don't worry too much, for maybe we can find the new nest. I know of several other Harvester colonies that have moved within the last few days.

FLORENCE. Boys, suppose you dig up the old nest so we can see the rooms and galleries.

ALBERT. Here is a pick and shovel for us and a pencil for Florence. She must make a sketch of the nest.

FLORENCE. Why, here's a piece of paper lying on the nest—with verses on it. Let's read them.

SONG OF THE ANTS AS THEY MOVE.

October 1.

As the sun hangs low o'er the ocean so grand,
And the breeze is lulled on the shore,
We must gather together our children and queens,
For this home—we shall know it no more.

Wherever we go and whatever befall;
However the world turns round;
Whoever may come and whoever may go,
To you we forever are bound.

You say we are brave, and you say that we work;
You say we are honest and true;
You say we are clean—that we care for our young—
So our mem'ry shall linger with you.

DOROTHY. Let's try it to the tune of Nellie Gray.

* * * * * *

FLORENCE. Well, I've finished drawing the ants' nest. Come and look at it. Cecil will have to explain about the nest.

ALBERT. Ladies and gentlemen, permit me to introduce Professor Cecil, who will now give an illustrated lecture on "The Plans of a Black Harvester Nest."

CECIL.

A, B, C, G and H were built in earth cracks that had become filled with gravel and dirt. Each was a tall apartment, made up of a number of small chambers, galleries and pillars.

D and E looked like grain chutes.

J and F each had a wooden ceiling a few inches long

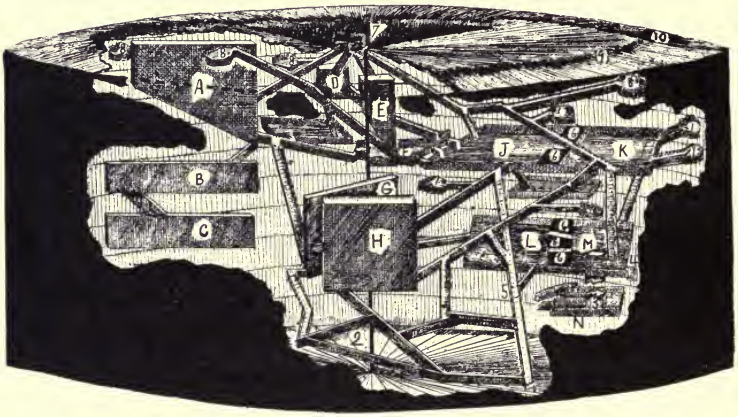


Diagram of Ants' Nest Drawn by J. Dean Simkins.

The Plans of a Black Harvester Nest.

and made level by gnawing off the decayed under side of a dead root bulb of a greasewood or other shrub that had grown there. The gnawing exposed four large year growths of the wood on one of the bulbs.

F, J and K together made a beautiful, large, low-ceiling reception room for a thousand ants.

N was a small room a foot below the surface, damp and cool.

1 and 8 were small rooms. Those near the surface were used as sun parlors, or warm rooms, for eggs and babies in daytime. At night, no doubt, the small, warm lower rooms were used for the same purpose.

2. A network of hallways extending down to damp adobe. (A shallow depression under a business room in this city held water the year round.)

3. Hallway connecting M and N.

4. Probably an airshaft connecting with an open earth crack.

5. A well, maybe.

6. Pillars between J and K and between L and M to support the large roofs.

7. Entrance to door at surface.

8. Explained above with "1."

9. A ridge around the door made by the gallon of (packed) dirt carried out of the nest while mining the home.

10. The rubbish pile, or kitchen midden, made largely of chaff, but contained a few skeletons.

Many of the rooms were ventilated, either by connection with earth cracks below or with the surface. The ceilings of the large rooms were supported by pillars near the middle. Some of the shafts may have been wells. (The bean patch was irrigated.)

FLORENCE. In what shape did the ants leave the house? Did they sweep out before they moved?

CECIL. Don't bother the speaker. You might say the house was perfectly clean. Hardly a clod, or seed, or skeleton remained, and there was no loose dirt anywhere. The ants had taken their grain with them.

FLORENCE. And their guests. Don't forget to tell about them.

CECIL. They left no guests except a hundred small white mites that lived in tiny hallways that pierced a two-inch pillar located between G and K. I suppose these white mites were the ants' ghosts.

KENNETH. This nest was located in a hardpan knoll at the crossing of two earth cracks that had become filled with gravel and dirt.

CECIL. The hardpan below was yet damp enough to be pressed into balls, although there has been no rain to speak of since last spring.



Photograph of One of the Rooms Showing Hardened Walls. A piece is broken out on one side.

ALBERT. How is it your diagram figures only about a half gallon of dirt removed, and yet we know there was a gallon?

FLORENCE. I suppose I omitted some of the apartments and maybe you didn't allow enough for hallways. You know this was largely hardpan, and I don't suppose the dirt was as solidly packed in your bucket as it was before it was mined.

CECIL. The ants seem to treat the walls of their rooms to make them harder than the dirt in which they are built, as shown in the picture. The room is lying in a wheelbarrow.

KENNETH. No especial care was taken in removing the dirt from the outside of the wall.

* * * * * *

FLORENCE. I declare I feel lonesome. I wish I could find our ants' new nest.

DOROTHY. So do I.

CECIL. We've hunted several days and might as well give up.

KENNETH. I feel like an orphan or something. I've nothing to like.

FLORENCE. Never give up. Run here, all of you. I've found the nest.

ALBERT. Here, form in a circle. Now, all together: Hip, hip, hip, hurrah!

CECIL. The new nest is forty-five feet from the old one, and is by the telephone pole across the alley. It's been used before, but isn't much of a home. It's too low for the rainy season. They'll just stay here until they can find a better place.

CHAPTER X.

October 18 to November 15.

The New Home. Why Ants Move.

FLORENCE. Well, Ant, how do you like your new home?

ANT. I don't know yet.

ALBERT. There's plenty of wild oats near here, and I guess you came for that. You won't have to cross the alley now, nor go so far to the harvest field. But I think you'll find that too many other animals live in or around that pole to suit you.

CECIL. I guess ants are like men. Sometimes they have to use any kind of a house until they can find a better one or make one.

KENNETH. One of your ants had the palsy today, for it shivered and jerked for fifteen minutes. All this time fifteen of your ants were examining it all over with their feelers.

ANT. Of course we might have nervous trouble at such a time as this. Did you ever move? You see, you don't even know why we moved yet. Watch out the next time we move and maybe you'll learn something you don't know.

KENNETH. When that ant quit jerking, it stood upright and then ran its two hind legs over a straw, letting its body swing below for a few minutes. A regular gymnastic stunt. I then placed the ant in my hand and

found it staggered and didn't know anything. I looked further and found one feeler gone.

ANT. If it had a stroke of some kind and was dangerous our ants may have removed a feeler to make the sick ant harmless. But how do you know this crippled ant didn't lose its feeler in a battle that caused us to move?

CECIL. Suppose you name all the reasons you might have for moving.

ANT. We might move on account of enemies, visitors, flood, drouth, cold, heat, bean patch, or scarcity of food. We might move to high ground for the rainy season. Some ants may send off a section of their family to start a new colony. I suppose we move for about the same reasons you do.

CECIL. After the rainy season is over, many insects die of old age, starve, hibernate, or change their forms. Some move to watered lawns, while others live in earth cracks or otherwise hide in daytime.

ALBERT. I notice that when man moves, some of his ant families do also. Fifty colonies live in or near this watered lawn, but not one in the dry bean patch.

CECIL. Yes, but that is because there are no weed seeds in it now.

About Ants' Nests.

KENNETH. Some Harvester doors are long slits. These follow old earth cracks or are caved-in subways or sun parlors. I looked in a large door and found the ants were closing the smaller inner doors with a pile of pebbles collected for that purpose. The nest was over a year old.

CECIL. I found the funniest crater eighteen miles east of San Diego. It was three inches high and only four

inches across the base, and the steep inner cone was nicely paved with pebbles. I dug up the nest but found no ants.

ALBERT. I've seen the Garden ants do that. They generally keep many small grains of rock on the inner slope.

CECIL. Our ants closed their doors up tight today—even used fine dirt. Two Acrobats that tried to break in failed. Burglars, as we have witnesses many times.

DOROTHY. Last evening I sprinkled your yard until your soft earth pellets crumbled and until the earth was wet a quarter of an inch deep. Your ants enjoyed the mist. The water collected on them in little balls.

ANT. When we have time we keep our bodies so well oiled and burnished that mist, fog or dew will not wet us.

DOROTHY. We have no big ant mounds, like those in the foothills.

KENNETH. Livingstone found ant hills twenty feet high in Africa.

CECIL. Yes, and some ants in this country remove dirt equal to 464 Pyramids of Egypt, when you compare ants with men in size.

ALBERT. One writer says that a colony in the Garden of the Gods removed 360 cubic feet of earth and went down in the ground eight feet. This would equal 1,408 feet in depth for man.

KENNETH. A man found that ants tunnel under small streams, too. A tunnel 650 feet long was found in Texas, and the door was 450 feet from the nest.

CECIL. They say some ants build towns—several colonies near each other. The population on a few acres may equal that of China—400,000,000. In times of danger and when accidents occur to a nest, the colonies help each other. A single colony has been known to have 200 branches. An-

other town had over 1,600 nests on eighteen square yards, or was this a single colony?

FLORENCE. I wonder how they could make a living.

ALBERT. I've been waiting to see how an ant makes an earth pellet out of damp clay—the kind of earth balls the ants build their craters with. Well, today I saw one work some mud back between the muscles of her forelegs with her jaws and front feet. She pressed it into a ball with her jaws between the muscles of her forelegs. When the ball was big enough, she carried it away.

Sun-Parlors.

CECIL. I pushed my pencil on the ground and it went into one of your sun-parlors. The roof was only a quarter of an inch thick.

KENNETH. One day I did the same thing, and six ants rushed out the opening into the hot sun, but they couldn't stand it long.

ANT. You are mistaken. You just opened up an old door that we had closed with clods—a ventilator. Of course, we could escape through it also, with our babies and grain, if necessary.

KENNETH. I believe I could crowd your whole colony into a little box an inch long, high and wide. What do you make such a big house for?

ANT. Isn't your house larger than your family?

KENNETH. Well, I've repaired the sun-parlor I caved in by placing a glass roof on it. I covered it with dirt to keep the violet rays of the sun out so you can keep your babies and eggs in it. I can wipe the dirt off when I want to see what you are doing.

ANT. Thank you.

KENNETH. I see you have cleaned out the room and

made it look all spick and span. Once, when I forgot to put the dirt back on the glass roof, the ants did it for me and, at the same time, they plastered the ceiling with dirt and sticks to keep the sun out.

FLORENCE. What do the ants keep in the parlor?

KENNETH. Through the heat of the day they keep the room full of babies and pupae, but I haven't seen any eggs. They are very small, you know.

DOROTHY. Anything funny happen?

KENNETH. Yes. One day an ant was standing on the ceiling holding a pupa up against the glass. I surprised her and she let go and both fell through the hole in the floor.

DOROTHY. What else?

KENNETH. At another time an ant knocked a pupa off a shelf and it fell down the stairway to the depths below.

ANT. That wouldn't hurt it. Did you notice that we removed the plaster from the ceiling after you replaced the dirt on the glass roof?

KENNETH. Yes. I also noticed that I made the room too close when I packed wet clay around the edges of the glass because the ants opened up a ventilating shaft at one side and filled the hole up with clods and gravel.

CECIL. Maybe that was for a door in case they were attacked from below and had to escape with eggs and babies.

KENNETH. You see our ants are masons, for they plastered their glass ceiling. They have now enlarged that sun-parlor on one side and built a wall of earth pellets straight up on the opposite side, and they can harden the walls of a room to keep it from crumbling, as we know.

CECIL. When do the ants use the parlor?

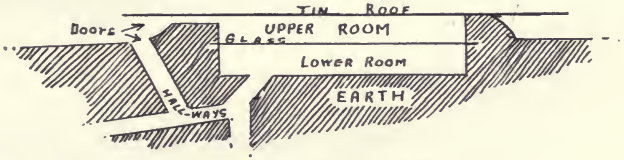
KENNETH. They take their babies up into the room about eight in the morning and lay them down, or pile them up, or hold them in their jaws. In the evening they take them down below.

CECIL. I see.

KENNETH. They move the babies around a good deal, keep feeling them, often stand on a pile of them. Some stand on the glass ceiling whether holding babies or not.

CECIL. What effect does removing the dirt covering have?

KENNETH. Even though I scrape but a little dirt off the roof very quietly, the ants soon scurry out of the room with their babies. Ants can't stand the violet rays of the



Sun-Parlor of Black Harvester Ant.

sun very well. Maybe they feel me or hear me through the earth, also.

FLORENCE. I saw you making our ants a new sun-parlor today and have drawn a picture of it.

KENNETH. Yes, I've made them several sun-parlors. You know I removed the dirt roof and put a glass one on some weeks ago. Afterwards I exchanged the glass one for a tin one. Well, the other day I raised the walls one story and put a tin roof a half inch above the glass one. The ants made the lower sun room and I made the upper.

DOROTHY. How do the ants like your new upper story?

KENNETH. I guess it's all O. K. At least fifty ants were in it today, but there wasn't a single ant in the lower room.

The Garden Ant.

ALBERT. One of you spoke of a town of ant colonies. Why, I think this little Garden ant builds towns around here. Right now there are sixteen colonies of this ant strung along this alley, all in or near a line fifty-eight feet long. I've seen them swarm as early as February. Just the larger colonies swarmed. Runners passed from nest



GARDEN ANT, City.

to nest. The ground around the swarming colonies was covered with excited guards.

FLORENCE. I saw them. When the hour came for flight the excitement amounted to almost a panic. The kings and queens were urged in every way to make the venture.

KENNETH. The queens were large, but there were only one-tenth as many of them as kings. It took an hour to get the royalty off. After they shook out their wings and pumped up their bodies they were soon out of sight.

FLORENCE. After they were gone the workers went into the house. This happened on a warm, quiet day.

KENNETH. Some of the royalty were so abused they couldn't fly, and I pitied them. Those that tried to run

away met guards on every road. Some climbed weeds to escape their tormentors.

ALBERT. A month later the largest colony swarmed again.

KENNETH. After the next rain the city was rebuilt, but the colonies were fewer and several had changed locations.

CECIL. This is the most common ant in southern California. Draw an east-west line across the United States through Illinois or another through Argentina, South America. Much of the territory between these lines is inhabited by these ants. Anybody can find their little craters on hard, bare ground around the house of man, along the walks, and often elsewhere. One-third of these in this alley are in a wagon track.

ALBERT. Once I saw a small boy brush the crater of a Garden ant colony with a broom, mixing up ants and dirt. The ants rebuilt nearby, but a playful kitten repeated the broom act with its paws.

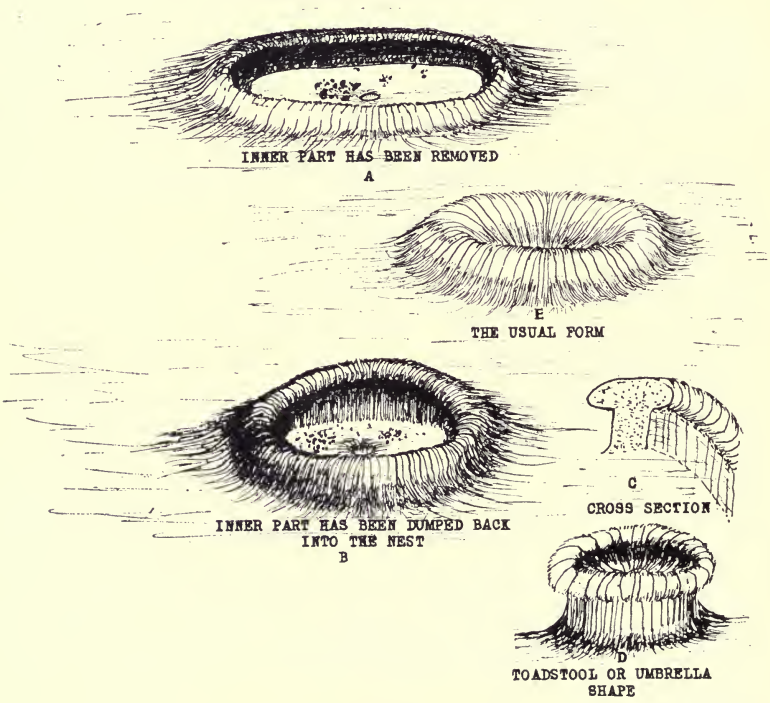
KENNETH. Yes. That colony built on top of a pile of dirt on which animals and children like to play. Unlucky ants.

CECIL. And that wasn't all. A colony of Acrobats visited them for several nights. The visitors became such a nuisance that the other ants rebuilt six inches away. Then the Acrobats used the old nest as an operating station or as a resort. After the rebuilding was repeated several times, the Garden ants could not be found, or the Acrobats either.

ALBERT. The visitors didn't bother the others except at night time. So one day the Garden ants thought they would fool the loafers. They carried the dirt of their own

crater back to the door and dropped it down the stairway, as if trying to fill the room with it.

FLORENCE. Yes, and in doing so they showed us one way that umbrella-shaped craters are made. Figures A, B and C show the different shapes the crater took as it



Craters of Garden Ants.



THE GARDEN ANT.

Worker of Dorymyrmex pyramicus. Notice the pyramid above the base of the middle and hind legs.

was being carried away. Finally the disk was all gone except the broad base.

ALBERT. One year, after a rain, the ants were mining. They dumped the wet dirt over the top. It stuck and formed the outer eaves. The inner eaves are made by the undermining, as you say.

FLORENCE. But why do the Acrobats dump their craters back into the house sometimes?

CECIL. They do this if the Acrobats have gotten into the house. The Garden ants try to keep the enemy out by building pyramids of stone and earth over the doors, but if they fail they dump the crater back into the nest.

ALBERT. I saw a dozen Garden ants that were greatly excited. Half of them were dumping the crater back into the house and the other half were carrying the dirt out. You saw them.

CECIL. Whenever they would get too much of the dirt out of the door I could see the gun of an Acrobat pointing right at the Garden ants. They would get shot, too, for they would act crazy for a time.

ALBERT. Then we dug up the nest and found six Acrobats inside, but nothing else. There was one tunnel two inches long and one three. The enemy ants were at the ends of the tunnels. As the ants rebuilt at once in the same place, there must have been a third tunnel in which they were hidden.

CECIL. So, when you see the Garden ants dumping their crater back into their stairway in an excited manner, it is a safe guess that the Acrobats have broken into the house.

FLORENCE. I remember that in dry weather their craters are all alike, and in wet weather they often differ.

CECIL. They just happen to be different in wet weather.

One year in October, after the first rain of the season, I found several different shapes. One was a perfect cone with a small door at the top; one was a round chimney, but most of them were the shape of a toadstool with one side removed.

ALBERT. Yes. When they dump the dirt over the top it rolls down or is tramped down, if dry, but sticks and makes an over-jetting roof if wet.

CECIL. Some of these wet craters are an inch or more high. I've seen these ants work in a drizzle and build such a crater in twenty-four hours. The royalty often walk over the crater at such times.

ALBERT. As such craters are so steep on the inside the ants can't have a pile of stone by the door, they fill up the inside of the crater until the slope is more gentle.

CECIL. One year, after the first rain, I counted twenty-six nests along a footpath, but only one right in it. At the same time, and on the same lot, I counted forty little mounds thrown up by the queens of this ant for new homes. They didn't mine an inch deep. They chose a time when mining was easy.

KENNETH. One day they tried another scheme against the unwelcome Acrobats. They plugged up the door tight, opened another a half inch away, built a solid pyramid of stones and dirt over the new door, and then plugged up the final entrance.

CECIL. Yes, and at night time the Acrobats came as usual, but couldn't get the old door open. They all went away but four, and these worked for three hours, and I don't know how much longer, tunneling under the pyramid of stones, but failed to open the new door.

DOROTHY. I'd like to see the Acrobats get the good

thrashing they deserve. They even search the grounds of the Honey ant.

CECIL. Most of the Garden ants around here are the dark variety, but a few colonies are the variety called bicolor—have two colors—black abdomen, and the rest of the body brick-red. (Dorymyrmex pyramicus, the dark variety. Common here. Dorymyrmex pyramicus var. bicolor, has dark abdomen, but other parts reddish).

DOROTHY. How can you tell this common ant from others around here?

CECIL. It has a pyramid or low cone on its thorax—not on its pedicel. It has one hump, or scale, on its pedicel.

DOROTHY. The other Garden ant (Tapinoma sessile) looks like it, but has no pyramid on its back and the hump, or scale, on its pedicel lies so close to the abdomen (gaster) that you can hardly find it.

KENNETH. The Garden ants often mine their homes right on our ants' yard, but they don't enter the nest of our ants half as often as the Acrobats do—in fact, hardly at all. Our ant yard is bare and sunny, and then the ants waste a good deal of food for the Garden ants to eat. Watch them search the premises of our ants.

CECIL. A strong colony that had lived in the same nest a year, slowly carried pupae to another nest forty feet away, and this was in February. Only a part of the colony moved. They often carry their young from one nest to another. Maybe this is to save them from the Acrobats.

DOROTHY. A worker sticks a half dozen babies together and carries them all at once.

FLORENCE. Generally it takes several days to remove the babies from one nest to another—often forty feet away. Only a few are allowed on the trail at the same time. The

colony seems to live in both houses, and ants travel from one to the other.

DOROTHY. Sometimes several houses will be in the same circuit.

CECIL. This ant eats dead insects and the rejects of other ants. Occasionally they drag home a few star thistle seed.

DOROTHY. Their kings are the same size as their workers, but their queens are larger.

CECIL. When the Garden ants are crushed they give off an odor that is pleasant to some people. This is called Tapinoma odor, because it smells like the odor of the other Garden ant by that name. It is poisonous to its enemies. The poison of most ants is not an acid.

ALBERT. Ants that don't sting may be able to eject more poison than those that have stings. Some can spray it a distance of two inches.

The Fire Ant.

DOROTHY. The Fire ant around here is small—only a little larger than the Garden ant. It is rather scarce, too.

CECIL. This morning five hundred Fire ants (Solenopsis geminata Fabr. subsp. maniosa Wheeler) lay stiff on the cement walk by our house. I suppose they started across last night, but when they struck the cold cement they got so stiff they couldn't walk.

KENNETH. They must have been forced to leave home.

CECIL. The sunshine soon limbered them up. Several had been stepped on by persons passing by. About half a dozen had babies with them.

FLORENCE. And now they'll have the grippe.

CECIL. I thought I could feel the sting when I held a few of them to the back of my hand.

Dwarfs. Scale Showing Sizes of Ants.

DOROTHY. Sometimes small ants make raids on our cupboard.

ANT. Same here.

DOROTHY. Why don't you catch them?

ANT. Why don't you?

CECIL. Strange that such small ants can capture a large one.

ANT. The small ones are likely to have poison or stings, and to be good fighters. But four or five may give up their lives to capture one large one.

KENNETH. You say that most colonies have two main sizes of ants.

ANT. Yes. The large ones are called Major Workers and the small ones Minor Workers. Minims are still smaller. There may be a few of other sizes.

KENNETH. I buried some walnut kernel near the telephone pole hoping to catch some stray ants. Afterwards I found 500 tiny ants eating the nut. They were less than one-sixteenth of an inch long.

CECIL. This ant (Solenopsis texana) is light yellow; has two humps on its pedicel, and its eyes are mere dots under the glass. It lives underground, steals babies through its small galleries; will also eat seeds; may see light, and has a queen a thousand times as large as a worker. We might call this the Dwarf ant.

ALBERT. I wonder if it is the ant that is making its craters only as big as a nickel.

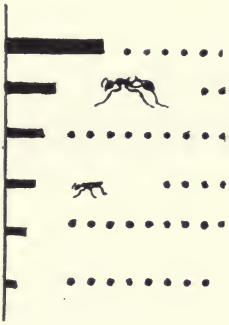
KENNETH. Those at the pole dumped quite a pile of nut flour out of their mouth pouches, and it was as fine as dust. They left in two weeks.

FLORENCE. I've tried to draw a scale showing the

sizes of ants around here. I did not include the Tapinoma Garden ant because it's about the size of the Garden ant mentioned. The Fire ant around here is slightly larger than the Garden ant—about the length of Longlegs.

Length of Ants.

The length of the Black Harvester ant, the one observed, and also of others that lived near by:



1. Carpenter. Camponotus maculatus subsp. vicinus, var. luteangulus Wheeler.
2. Black Harvester. Veramessor andrei. Our ant.
3. "Robber Ant." Eciton opacithorax.
4. Acrobat. Cremastogaster lineolata subsp. coarctata.
5. Garden Ant. Dorymyrmex pyramicus.
6. Very small yellow ant. Solenopsis texana (?).

There is also another Garden Ant the size of No. 5, Tapinoma sessile.

No. 1—1-2 inch. No. 3—3-16 inch. No. 5—1· 8 inch.
No. 2—1-4 inch. No. 4—5-32 inch. No. 6—1-16 inch.

CHAPTER XI.

November 15 to January 12.

The Robber Ants Make Their First Attack on Ours.

DOROTHY. I saw a strange ant, scout maybe, around your door. Better look out.

ANT. We are expecting trouble. Have you noticed that we've opened up a new door five inches from the old one?

FLORENCE. And you've not been working for several days and go moseying around in a dazed sort of way, as if you're afraid you'll step on something.

ALBERT. I think we better come back in the morning to see what's happening.

* * * * * *

KENNETH. Hello! You're here early. All come and we'll peek into the sun-parlor. Why, that's funny! The room is crowded with fifty ants smaller than ours. See them hiking down stairs. None of ours are out.

ALBERT. I believe they have moved or something, or those fifty strangers wouldn't have gone down into the nest. Let's come back tomorrow morning.

CECIL. All right.

* * * * * *

KENNETH. Morning, all. Now, watch while I wipe the dirt off the glass roof again. The same fifty strange ants are in the parlor. Well, what do you think of that?

DOROTHY. Yes, and here a dozen of our ants are hiding under some salt grass.

KENNETH. I've caught one of the fifty, and it's an Acrobat, but that ant never drove ours away. Some other ant has done it. Why, ours have been in this nest only six weeks. We didn't think they would live here long. Still, I don't believe they left of their own accord.

CECIL. The Acrobats like to live near the surface. They surely did enjoy that sun-parlor. They have small colonies and are not supposed to eat nuts or grain.

DOROTHY. Look here! Sixteen of ours are passing by, five feet away, and two of them are being carried by others. They have no home ready and don't know what to do. I'm sorry we dug up their old one, for they could go back to it now if we hadn't.

FLORENCE. If our ants had been smart they would have had another nest ready. We must find out where they are hiding and help them until they get a start.

CECIL. All come back tomorrow.

* * * * * *

KENNETH. Morning. Why, the Acrobats have left the parlor, too.

FLORENCE. There go thirty of our ants past on the trail, and four are being carried. I guess the four are rattled and don't know what to do. I wonder where the eggs and babies and queens are hidden while the ants find a place for a new home?

CECIL. A few keep coming back to examine the old home, but I suppose they carry away a bad report. We don't know what is down in the old nest.

FLORENCE. Hurrah! I followed an ant and found the new home! It's on top of a little bank only fifteen feet from the old home. It's just a crack in the ground and the ants will have to make a nest of it as soon as they

get over their excitement. Something awful must have happened, the way they are confused.

ALBERT. Several kinds of ants visit ours and I don't exactly like the looks of Longlegs.

CECIL. Well, forget it. This is Thanksgiving day.

FLORENCE. Yes, for us, but not for our poor ants. You don't know what I've seen. One of our undertakers came back to the old home and worked five hours all by herself. She carried out of the house twenty-one bodies and thirty-fours heads of our ants and left them in a pile.

ALBERT. What?

FLORENCE. She made fifty-five round trips before it got too cool to work. The bodies were all badly torn and the flesh had been removed even from the skulls—nothing left but the skeletons.

CECIL. There's been an underground battle, then, sure enough.

FLORENCE. I'm not done yet. The next day she carried out, all alone again, fourteen more heads, twenty-seven bodies and twelve abdomen plates—all sucked and licked dry inside.

KENNETH. Just think of it.

FLORENCE. I found eight skeletons of another ant near the door, also.

DOROTHY. Good, good, good! Our ants killed a few of the enemy in the fight, anyhow.

FLORENCE. Still I'm not done. Today, and this is the third day, our undertaker is still at work. This time she carried out twelve more heads of our ants, four bodies, and one abdomen. This makes sixty heads in all that she has brought out of the old home.

ALBERT. That beats anything I ever heard of.

FLORENCE. I found thirty-two more bodies of the

enemy ants piled by the door, making forty in all that ours killed in the fight before being driven from home. That is, we know of that many.

CECIL. The battle was sixty to forty against ours, then. Well, I'm glad our ants put up a stiff fight, anyhow. And, no doubt, some of these savage ones were still in the old home while our undertaker made her 125 dangerous trips all alone.

KENNETH. Yes, and she may have carried out the forty bodies of the enemy besides.

CECIL. You say this ant worked five hours one day without stopping, but I think ants can work longer than that when the weather is right. I suppose she worked, too, when there was no queen in the nest. If so, this is interesting.

DOROTHY. That undertaker must belong to the First Aid Corps, or to the Ambulance Corps, or to the Red Cross.

FLORENCE. Just think of it! She was one of a thousand brave enough to do it. Blind and alone, she went down into that dark house of the dead, probably among the fierce enemy, to search for and rescue the bodies of her murdered sisters.

DOROTHY. I can hardly believe it.

FLORENCE. A hundred and twenty-five times did she enter that "gloomy abode of the dead," to carry a comrade's head or body from no-man's-land to a more decent resting place. She had no guard to protect her, no queen present to encourage her, and no ant at the door to welcome her return.

CECIL. You're becoming serious.

FLORENCE. No fear of spooks or enemy's jaws, stings, or poison could keep her from doing her duty to the dead at the risk of her life. Yet, she will never get any credit

marks, never be heard in song, and never get her name on a monument. I shall always believe she did this work without any help. Anybody that had seen this would believe the same.

DOROTHY. Quit or you'll have some mourners around here.

FLORENCE. As I sat for hours watching her, she didn't pay the least attention to me—she was too much interested in her sad task.

CECIL. The day-to-day life of an ant has many surprises. I now see that many thousands of animals; yes, millions, have to work hard for a living and fight hard against enemies.

KENNETH. They never know one day what will happen the next. They are worse off than we are in this respect.

FLORENCE. You boys will each be a Gloomy Gus if you don't shut up. Life is a game to enjoy if you get mixed up in it right, whether ant or man.

ALBERT. Well, it's plain that our ants have been whipped and driven from home by some enemy, and here's a pile of forty dead ones that belong to the colony that did it.

KENNETH. Let's examine the bodies of the enemy and learn something about them.

CECIL. They are reddish brown, well built, over one-eighth of an inch long, and have no eyes. They have wicked looking jaws. The bodies are rolled up and not torn. (See illustration, p. 243.)

KENNETH. Why don't you name them?

CECIL. They are Foraging Ants, by name "Eciton (Acamatus) opacithorax." In fact, they have different names—Foraging ants, Visiting ants, Legionary ants, Army ants. None of these names is bad enough to suit us so

we'll call them Eyeless Robbers, or Robbers. These Robbers live in the warm parts of America—say from here to Patagonia—and attack various Harvesting ants all along the line. The Driver ants in the warm parts of Asia and Africa are much like these Ecitons, or Robbers, but, if possible, worse.

KENNETH. Then they are robbers, highwaymen, cutthroats, murderers—anything bad you want to call them.

CECIL. The Robber is the savage of the insect world. Often it has no fixed home; sometimes marches from place to place like soldiers, and steals and eats the babies of ants and other insects. But it will not touch those it finds dead.

ALBERT. Something ate the full-grown bodies of sixty of our ants.

CECIL. A colony has but one queen and no cocoons. Often the families are small, but sometimes very large. Each baby is carried under the body of an ant as the colony moves from place to place.

FLORENCE. I saw some small ants carrying some babies that way today. Their backs were dragging on the sidewalk.

CECIL. As some kinds of Robbers can't stand the light, such usually tunnel their roads as they go, but in our town they travel overland. They hide their nests when they have any and also their kings and queens. They will also eat seeds.

DOROTHY. What else?

CECIL. There are many kinds of these ants. Though eyeless, they move rapidly, lay many eggs, and have a bad odor. Sometimes this ant makes a home of its own. The kings and queens are queer looking insects.

FLORENCE. How do they hide their kings and queens?

CECIL. One way is for the workers to form a ball of ants around the royalty. These ants often collect in clusters like bees. They are likely to make their raids about four o'clock in the afternoon, but this depends on the weather.

DOROTHY. If most species of Ecitons carry on their raids in full view—often in sunlight—these must have entered the home of our ants to do the fighting.

CECIL. The females have no wings, but these ants are good travelers, and so are scattered widely. They are always on the move, too—have no fixed home.

Our Ants' Yard.

FLORENCE. Why keep your yard so nicely graded?

ANT. Isn't it a nice place to loaf? During most of the year, isn't it loose and healthful, admitting air and sunshine? Isn't it a good place to air the babies and a fine place for queens to exercise at night or in the evening?

FLORENCE. I see.

ANT. It gives our guards a chance, too. The earth pellets are from our mining camps, as you know, and we use them as rollers under our heavy loads sometimes.

CECIL. These pellets make a circular ridge around your door with an inner and outer slope of about fifteen degrees. Your yard is about two feet across when completed. Some kinds of ants scatter the dirt around thinly and without making a circular ridge.

ANT. Guess at some of the advantages this earth funnel is to us. You know our door is at the bottom of the funnel.

CECIL. All right. Besides the uses you named, it guides you to your door after you reach the crater; is a trap for

enemies; keeps game from escaping; prevents enemies from seeing inside the funnel; makes a good dry house; makes it easy for all near-by ants to rush into the house; changes the wind to an eddy; is a fine place to bury things you can't move, and serves as a roof to the rooms below.

KENNETH. I saw some beetles tumble back while trying to escape from your crater. One couldn't turn over on your loose earth pellets when on its back.

ANT. You'll see disadvantages in our crater, too. The pellets roll under our feet when we don't want them to. Some small enemies hide in the loose dirt, and you have learned of one big enemy that does so. Why, sometimes that horned toad buries itself in the dirt of our nest because it's a nice place for him to sleep in daytime.

CECIL. I suppose the mites and other visitors clean up your yard for you, the same as you clean ours for us. Funny world, isn't it?

KENNETH. I saw you having trouble while dragging out large pieces of chaff over your earth pellets. So I thought I would help you by paving a part of your yard with a nice, smooth stone, but you covered it up with dirt.

ANT. We can pave our inner grade with stones if we want to, thank you.

KENNETH. Why do you make such a large house?

ANT. Why, I hear that man often enlarges his house and then hires servants to take care of the part he doesn't need.

KENNETH. Doesn't that funnel around your door run the water in when it rains?

ANT. Oh, a little, but some of our rooms are high and the lower ones are often drained into earth cracks.

KENNETH. Why do your funnels grow larger and deeper as the nests grow older?

ANT. Because the rooms around the door keep caving in. Notice the deep funnels around the door of old abandoned nests.

KENNETH. It's queer that the wind doesn't blow away the coarse chaff that you close the door with. It seems to hold it in.

CECIL. Why, when the ants have the kind of door they want, the wind will even hold feathers in it. The eddy formed by the funnel seems to be the cause.

KENNETH. As your southwest wall crumbles off, you follow it up with a new door, closing the old one with pebbles, and sticks and clods.

ANT. Yes. The old covered stairway then makes a nice ventilated room for eggs, babies and queens.

KENNETH. That southwest wall makes a good shade for your guards in the hot afternoons.

CECIL. I have seen you close your door with chaff, sticks, stones, clods, dirt, and insect skeletons, but with chaff generally.

ANT. We close it to keep the heat or cold out and sometimes to keep enemies out. See this little pile of gravel? That's to close the door with if we should need it. You know we might happen to be out of chaff.

ALBERT. How in the world can you mine this red hardpan?

ANT. Below the surface it stays damp a long time, but we could mine it even if it was almost as hard as sandstone by moistening it with saliva. That's the way the mason wasp does. You know that Hannibal softened the Alps with vinegar.

KENNETH. You removed about six square inches of crust that formed when I sprinkled your yard.

ANT. We could have a solid floor to our funnel if we

wanted it. Some of the upper rooms are ventilated through the loose dirt. See what you did? We had sun-parlors under that crust.

Ants Are Useful to Man.

KENNETH. You don't bother man, but some ants do. Some annoy him by what they eat, some by where they nest, others by herding harmful insects, some by living in his house or eating it up, and still others sting or bite him.

DOROTHY. Do ants do more harm or more good to man?

CECIL. I think they do much more good than harm, and that some kinds should be protected by law. One country does so. Our ants should be protected, and so should any kind that destroy harmful ants. If I could discover a kind that could destroy the Argentine ants, many people would be happier than they are.

ALBERT. We've named several uses before. Are there others?

CECIL. The books say that in China orange growers ship ants from the hills to destroy worms. Bridges are made of bamboo rods from tree to tree for the ants to cross on. Ants have too many uses to mention here. Man has used ants as an object of study for thousands of years.

ALBERT. Do most ants sting?

ANT. In this country, about the home of man, only a few kinds have stings large enough to bother him, and many have none at all.

KENNETH. The Fire ant around here can't sting us, but others of the Southern States and a large Harvester of the great plains and deserts of the Southwest have rather bad stings.

ANT. Ants that can't sting you might sting small enemies.

KENNETH. I should think that all you can do in plowing and enriching the soil wouldn't amount to much.

ANT. But suppose there were thousands of large colonies at work around here. Why, some places the ground is covered with ant hills as far as you can see—in fact, you can see nothing else. Some mounds are higher than a man's head and the apartment rooms run down several feet.

CECIL. And this has been going on for thousands; yes, millions of years.

The Carpenter Ant.

FLORENCE. Plenty of the big Carpenters have been around here all fall and we're still hunting for the nests. Of course, we are passing right by their doors every day, and don't know it.

ANT. That ant slips out of the nest at dark, or when you are not watching. You can't drive it home, for it won't go home when you are after it, but runs and hides.

KENNETH. Runs away from home like the mother partridge, and kildeer, eh? And for the same reason.

ALBERT. It is easily scared. Sometimes it runs, at other times it hides under something, and I have seen it play 'possum. You seldom run. Generally you fight back.

ANT. You say that ant isn't much trouble to man, but you'll find an objection to it if you keep watching.

ALBERT. If I should put several Carpenters in a small box they would poison themselves to death, if they were teased.

ANT. Yes, but on the other hand, a Carpenter was known to live forty-one days after its head was cut off,

and the body walked up to the last two. Other ants have been known to live from three to four weeks after such an accident.

ALBERT. Last summer I picked up the rind of a honey-melon. The lone Carpenter that was on it lay down on her side as if dead.

KENNETH. Have you given all the reasons for so many dead Carpenters around here? Our ants have been carrying them by the dozen all fall.

ANT. Their natural home is over in the foothills. When they move to town many of their colonies die off. They are learning to be a house ant, you know, since the discovery of America.

DOROTHY. I saw one today running from cover to cover along the sidewalk.

FLORENCE. Once last fall I put some sugar on a blackberry and fed some Carpenters. Their abdomens became four times as big as at first.

KENNETH. Once I turned my flashlight on fifty Carpenters that were eating a melon, and half of them ran away. But the books say they are entirely blind, and I suppose they are.

FLORENCE. A boy brought a big Carpenter to school and asked us to let it bite us. He said it wouldn't hurt. He was showing us how to let it get hold of the skin between the thumb and finger when it got a better hold than he intended. You ought to have seen him dance and heard him howl as he ran to his teacher for help.

KENNETH. The Carpenters don't travel around much after the rainy season begins. Our ants will not bring in many of their bodies then. The Carpenters house-up for winter.

CHAPTER XII.

January 12 to January 27.

Instinct, Learning, Memory.

ALBERT. They say an ant has instinct. What's that?

ANT. Acting for the community without the influence of self-experience and without knowing why you are doing it.

ALBERT. That's too much for me. But I think ants can learn. You know that you carried very few melon seed home until after Florence got to cracking them for you. After that you brought in a pile every day.

FLORENCE. Yes, and I've seen your ants drop twenty on the trail when the sun got too hot. Do you remember that time you stood on my thumb while I took the melon seed away from you, removed the kernel and handed it back? I then lowered my hand and you strutted away, taking the kernel home. Why, some of you are regular pets.

KENNETH. Yes, but not the young ones. I thought two of them had stung me today until I saw their sharp teeth and the sharp dagger on each jaw.

FLORENCE. At last I've made a trail that you will use, but you shy clear of the bridge over a tiny canyon. My trail passes across a mat of tangled grass that you could hardly get through.

ALBERT. Have ants memory?

CECIL. They seem to remember today where the seeds

were yesterday, but their memory may not be like ours.

FLORENCE. I guess nobody can tell what instinct is. Seems like we do most everything by instinct—same as the ant does. I guess the intelligence of an ant is mostly a fable, like Æsop's fable of the wise ant and the singing grasshopper.

ANT. That fable is thousands of years old. Children of all nations and all languages read it or hear it and maybe believe it.

CECIL. I agree that most all we have seen our ants do are illustrations of the working of instinct.

FLORENCE. Give an example.

CECIL. Once in Ohio a large ant was attacked by small ones, and killed, but several of the small ones lost their lives also, or were crippled. Then the crippled and killed were all gathered up and taken to the home of the small ants, for I saw them taken.

ALBERT. I left a piece of spoiled flesh on the yard. The ants couldn't move it, so they covered it up—the same as man would have done. They did the same with a tin can lid.

KENNETH. Different kinds of ants sometimes move into the same house for winter and for other reasons.

CECIL. All these are illustrations of instinct, I suppose, when it happens to be ants instead of men that do it. I'll give another. In flood time some kinds of Fire ants take their eggs and babies and queens out of the nest, form a ball of ants with the young and royalty at the center, change places often enough to keep from drowning, and float to some shore.

Traps. Snares.

FLORENCE. You told us how the ant lions set traps for our ants and once filaree chaff coiled around one of our ants.

CECIL. Yes, and afterwards I found another ant trapped in the coil of that seed. After I dropped the seed in water, the coil untwisted, freeing the ant. I carried her home. After she brushed and combed, she walked into the house all right, except one leg was a little stiff.

KENNETH. I suppose the ants get trapped in the morning when the tails are coiling up. If the workers are not squeezed to death they might get loose the next night, when the tails get damp and uncoil.

CECIL. The seed is trying to plant itself.

FLORENCE. I wonder if the coil couldn't trap an ant while the ant is carrying the seed home?

CECIL. A spider built a trap in front of our ants' door last night and snared seven. This morning the other ants tried to break the guy ropes, but failed. I tore the trap down and threw it by the door. An ant tried to drag it away, but she got caught, too.

FLORENCE. Once I saw an ant get caught in some pine wax. You know that's the way the ants were caught that are now found in fossil amber.

CECIL. Pitcher plants fix up a bowl of water for ants to fall into. Then the plant eats them. Other plants secrete a wax to keep ants away from them, in some instances.

KENNETH. I saw three of our ants strung up in a spider web and also saw a spider carrying an ant away from the trail.

Animals That Live With Ants.

ALBERT. It seems that ants use some animals for food and treat others as guests. Those that are called guests are divided into three classes:

1. Those the ants would drive away if they could.
2. Those the ants don't care anything about, one way or another.
3. Those the ants like to have live with them.

ANT. Yes, and you might say the same of man.

ALBERT. How many kinds of the first two divisions together live with ants?

CECIL. One man has named 1,246.

ALBERT. How many of the third division live with ants?

CECIL. The books say there are 300 to 400 kinds of these welcome guests. Say 1,600 as a total of all three kinds.

ALBERT. Have all the welcome guests any one thing that makes ants like them?

ANT. As a rule they all bear tufts of red or golden yellow hairs. These give off a gas that ants like to smoke. Some think the hairs give off a sweet substance the ants like.

CECIL. Some of the ants become so addicted to smoking that they neglect their own babies. So their own half-starved offspring become lazy outcast workers or deformed queens.

ANT. Some of the bugs have the ants completely fooled, for they eat the ant-eggs and babies. Sometimes the ants trade liquid food for smokes.

CECIL. Why, the tongues of some of the beetles have

changed to spoons, and the feelers of some have changed to handles so the ants can carry the lazy bugs around. Some of the feelers have lanterns in them.

ANT. Some of the bugs are given joy rides on the backs of ants.

KENNETH. These ants are as crazy as the bird that rears the cuckoo's brood, or the cat that rears a puppy or rat, or the hen that mothers a kitten or gosling.

CECIL. Some of these bugs lay their eggs among the ant eggs and let the kind ant nurses do the rest. But ants will nurse almost anything that looks like an ant baby.

ANT. Why, these ants will rescue these bug babies before they do their own.

FLORENCE. I see why these bugs like to live with ants. Protection, home, food—all without work.

ANT. About 1,000 of the animals that live with ants are beetles.

KENNETH. Some bugs that live with ants have artillery and shoot an explosive liquid into the soft parts of the enemy to kill it or paralyze it. Suppose these bugs get too hungry and turn their artillery on the ants they live with. Then what?

ANT. For some reason many of them can not or will not turn it on the hand that feeds them—not even if they are attacked by the ants. But often they rob the ant nurseries.

FLORENCE. What effect does smoking have on the ants?

ANT. I've already told you. Too many loafers around these cigarette stands is about to destroy some kinds of ants, judging from their condition (social disease or social obsession).

CECIL. Man, ants and many other animals live in

groups instead of alone, like the cat. This is when they have plenty of food. I suppose that many of the ant guests lived alone and concluded they would move into ant colonies, where there was plenty of food. What if our ants would quit work?

ALBERT. I read of a small cockroach that lives with an African ant and takes airplane rides on the backs of the winged ants.

FLORENCE. How do the little crickets that live with ants make a living?

CECIL. They make a living by licking ants. They live on the oil and saliva that the ants burnish their bodies with.

KENNETH. You know our ants left a hundred white mites in the nest when they moved. I saw these same mites running around on the yard several times before our ants left.

FLORENCE. Certain other mites get on your body. Yes, and sometimes mould gets on you down in your damp house. How do you get them off?

ANT. We get the mould off with our rough tongues, and try to get the mites off the same way.

DOROTHY. What harm can mites do?

ANT. You saw the captured ant colony in the show-window of the drug store. Well, all the ants of a captured colony may be destroyed by mites. The same is true of a wild colony.

Animal Food.

ALBERT. I notice that many ants use other animals as food—even Harvester ants use some animal food. Our ants could hardly drag a spider because it kept spinning a thread that entangled the ants' legs.

FLORENCE. You don't always hunt in groups, for I saw a lone ant coming home from a distance with a cucumber bug.

KENNETH. I threw a handful of sow bugs into our ants' nest, but they soon rushed out covered with ants.

FLORENCE. I don't see how you can eat dried meat.

ANT. Is it any harder to eat than the dried seeds you see us carry home by the thousand?

KENNETH. Isn't the sow bug an insect?

FLORENCE. I should say not. The sow bug is a louse, a wood louse, and our ants eat it, too.

CECIL. I left a jumping spider and three large insect larvae on the crater and the ants carried them in. That spider can jump four inches. Once I saw it spring up from one weed to another.

DOROTHY. Often I see our ants dragging home the bodies of honey bees. I wonder if ants ever bother bee hives?

CECIL. Some kinds of ants will enter beehives for honey.

KENNETH. Once last fall I saw a Carpenter trying to keep bees, flies and yellow jackets away from the fruit parings. They all wanted the piece of cactus apple. The ant often fell several inches in springing at the other insects. The bees and yellow jackets wouldn't budge until they were actually tackled.

CECIL. An ant and a rose beetle were on one of the little posts by the nest. The ant climbed over the bug three times, lay close beside it for a while, held its mouth against the bug half a minute three times, but stayed by itself most of the day.

KENNETH. A rose beetle was on one of the little posts. I threw the bug on the ground. Five ants attacked it and

were carried up the post with jaws clenched on legs. An old ant tried to pull a feeler off, but her jaws slipped. After six trials she gave up.

CECIL. And then the ants carried the bug down and up to the door. After a scramble the ants carried the bug up the post this time, but soon left.

KENNETH. Then, strange to say, the bug went down and into the door, but was chased away. Its shell was so hard the ants couldn't hurt it much, but it lost a foot in the skirmish.

CHAPTER XIII.

January 12 to January 27.

Water. Rain.

FLORENCE. Do you drink much?

ANT. Ants like plenty of water, but can live a long time without it. We get it at the hydrants, on sprinkled lawns, and use fog, dew, or rain water. Some plants furnish water and the soft parts of animal food contain much. The walls of our lower rooms stay damp a long time, and besides we dig wells to damper ground, too.

KENNETH. I have laid a wet stick at your door and a dozen ants are drinking. They got enough in three minutes, not very dry. Once I thought I'd give you enough to eat and drink. This was the bill of fare:

Raw green corn—all carried indoors.
Cooked green corn—not touched.
Rind of fig—hardly noticed.
Flesh of fig—liked by a few ants.
Rind of cantaloupe—not touched.
Honey cantaloupe—several ate it.
Raw potato—but few cared for it.
Raisin and prune—well liked.
Cooked squash—no good.
Fly—O. K.
Cracked cantaloupe seed, squash seed, English walnut, filbert and almond—all carried in. Ants preferred the walnut.

DOROTHY. I gave our ants some sugar water. Why did so many fall in?

ANT. Sometimes water will wet an ant and sometimes it won't. When it does it runs up her legs and pulls her in. If the water dries and her feet stick to the dish, she may fall in.

KENNETH. I placed a little sweetened water in a flat dish. The next morning two dead ants were dried to the bottom.

CECIL. Why do our ants prefer dry sugar to sugar water?

KENNETH. I don't know, unless it is safer for them to do their own moistening with their saliva.

CECIL. I tried out the Honey ants, and they preferred the sugar water.

KENNETH. I set a can lid of water by the door. Some ants drank from the edge. When the rim was full of ants they held on to each other and floated on the water. The wind blew bunches across to the other shore, and some skated across alone. Only one ant sank in half an hour. They seemed to be having a great time at the swimming pool.

FLORENCE. I put some water in a tin scoop, set it slanting, and the first fifty ants that tried to drink slid in and couldn't get out.

KENNETH. One at a time I teased a dozen ants with a straw until they took hold of it with their jaws, and then I baptized them. They all came to the top except one.

ALBERT. When I want to float, I have to tie bladders, or water-wings, under my fins.

KENNETH. So do the ants. An ant forces air out of the tubes of its body. These bubbles, or bladders, stick to the ant and lift it to the top of the water. I counted from one to five bladders on each of the eleven ants that arose to the surface and none on the other ant.

CECIL. I suppose an ant can trap some air in the joints of its oiled legs and under its chin when you force it under water. Some spiders can do this. These bubbles would help lift the ant to the surface, also.

KENNETH. A ball of our ants could float across a stream now if the wind was right. They shine as if they had time to oil and burnish their bodies. If this doesn't quite tally with what we may see at other times, remember these ants were ducked.

CECIL. Yes.

KENNETH. I know a colony of Honey ants that live by a small pond that has water in it the year round. I saw some of these ants actually swim, the same as I can, and others could walk on the water by letting their abdomens touch the top film of water.

CECIL. That's a new one.

KENNETH. I put twenty of these ants in a bottle of water, and shook it for fifteen minutes, and they all sank. Two hours later they all came to the top and showed me what all they could do, and wound up by collecting into a ball and floating.

ALBERT. It drizzled a little this morning, and I was surprised to see that your ants enjoyed the mist. So I poured a quart of water on an ant. She dropped her seed, lay down, and was motionless.

CECIL. Yes; but after the puddle dried up, the ant came to, wiped off her feelers, and started back to the harvest field.

FLORENCE. How long could an ant live under water?

ANT. Ants differ in this—say, from twenty-seven hours to eight days. You see, there would soon be no ants if floods drowned them. Remember where they live.

DOROTHY. I wet the ground today, and the ants be-

came so thick that they stood on their heads to drink—a hundred to the square inch. They suck and lap the water from the ground. It took these a long time to drink.

FLORENCE. What do you do with eggs and babies when water gets into your house?

ANT. Rush them to upper rooms or to some dry place. Of course, the whole family is under flood waters some times.

KENNETH. I carefully set an ant on water, and it didn't break through the top film. The film will hold up a little greased needle.

CECIL. If an ant breaks through, often it can't get back on account of the film.

KENNETH. If an ant sinks in water, it may crawl a little on the bottom or up a stick, but the film holds it back even if the ant gets its head out. As a rule, an ant gives up under water.

CECIL. If an ant is heavy and its body not oiled up, it is likely to sink in water. Sometimes ants don't seem to be able to make bubbles that will raise them to the top.

ALBERT. A man said, "You can find water under that ants' nest." You might find moist ground, but you wouldn't find sheet water in the first few hundred feet.

FLORENCE. I wet the ground again, and a thousand ants came out to drink as usual. I dropped a big grasshopper by them. An ant grabbed a foot, and got several fine aeroplane rides free, but the landings must have given pretty hard jolts. I wonder if she ever got back home.

ALBERT. January, and no rain to speak of yet. The driest fall in sixty-seven years. No wonder our ants are thirsty.

CECIL. Water seems to wet the legs of Longlegs and

Acrobats at this time and bind them together with a film so the ants can't walk.

ALBERT. I kept a patch of ground wet from three o'clock until midnight, and several of our ants were drinking every time I looked.

KENNETH. I think I ought to say that last summer nearly all our dusty workers would sink when dropped in water. Hardly any of them do now. Even when pushed under water they come up like a rubber ball. Water doesn't wet them. One floated all night.

CECIL. Maybe they were well-fed, heavy and dusty last summer, but are empty, full of air, light, oiled and glossy now. You know the saliva has a little oil in it. This shines the body and kills bacteria and moulds and helps make the ants float.

KENNETH. I see. They have little to do now but arrange their toilets and get ready to float when the flood comes. Well, I think there is more to learn about this floating.

DOROTHY. So do I. I thought I'd water the ants, and so gave them some in a can lid. It ran up their legs and pulled seven in. They floated a while, and then all sank.

CECIL. Yes, but it began to drizzle at ten o'clock at night, and kept it up for six hours. Nine more ants fell into the lid of water, but floated from midnight until eight o'clock the next morning, eight hours, and were then well and lively. Even the rain didn't sink them.

FLORENCE. Dorothy, what became of the seven ants that you saw go to the bottom?

DOROTHY. I took them out sixteen hours after I thought they were drowned and in an hour they came to and went to work. Maybe they were sorry they missed the drizzle, for the other ants seemed to like it.

CECIL. Well, now I don't know what to think. Maybe the seven that sank were frightened at you and sank on purpose.

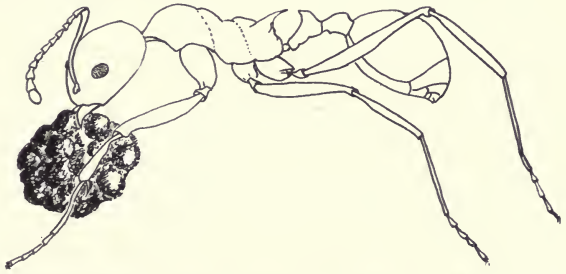
DOROTHY. If the queen can fill her tubes with air just before she takes her flight, why might not other ants do so when they don't want to sink?

CECIL. You see I ducked the ants in my experiment.

DOROTHY. The safest way to water the ants is to pour some water on the ground, as they will fall into a dish—at least, ours do.

Mining a Home.

CECIL. At last, January 12, we have had the first good



Harvester Carrying a Pellet of Earth, or Mud Ball.

rain of the season. It has rained a half inch. The Acrobats and Longlegs enjoyed the shower as well as our ants did. But only about seventy-five of ours were out at midnight.

KENNETH. Yes, but look at them this morning. Although they had done no mining in their new home, we thought they had closed up their doors a week ago and quit work for the winter, but see these 500 miners carrying out earth pellets. Probably there are that many more

inside digging the dirt loose. Don't they look happy? The rain must have softened the earth for them.

ALBERT. See the crowd of ants. They have opened up five new doors that we didn't know of because they were kept closed with clods and stones. Fine scheme to have these all ready when they should need them.

CECIL. The doors are jammed with dirt carriers two or three ants deep. Look at the rush. Never saw our ants so swift before. Must be getting ready for another world war. I wondered why they didn't go to work and make a decent home out of this earth-crack. They were waiting for this rain.

KENNETH. Here's a gang at work making a new door. All the doors are within a circle six inches across. I'm going to help. There, I made a new door with my pencil.

ALBERT. Shucks, yours is no good! Look at the ants filling it up.

CECIL. It's wonderful how much dirt a thousand ants can dig and carry out in an hour when mining is good. The rain made the earth easy to dig and mould into balls. You remember the undertaker that made fifty-five round trips in five hours. I think these are beating that record.

FLORENCE. I've seen a thousand ants out harvesting, but I never saw so many working in the mines before.

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CECIL. Good morning. Well, our ants worked all day yesterday and last night at midnight nearly two hundred were still on the job. See, some of them still wear a top-knot of dried mud, while others have a streak of it the full length of the back. Too busy to clean up.

ALBERT. They have carried out fourteen cubic inches in thirty-six hours, but only half that if well packed.

FLORENCE. According to those figures, our ants could

build a house in a day or two. But it's a good thing they are making more room. They will need it in two or three months for eggs and babies. I was calling our ants lazy about house building since they moved here, but I take it all back.

KENNETH. About a dozen went out and brought in some saltgrass seed while the others were mining.

ALBERT. Ours lived at the telephone pole six weeks before they were driven away by the Robbers, and they've lived here six weeks. I think they have concluded to fix up this house right, and will now quit going back so often to inspect the old one. They've given up the idea of moving back.

CECIL. The other Harvester colonies around here have room enough, for they're not mining much. This is the first real mining ours have done at this nest.

KENNETH. The Acrobats mined just like ours, after the first rain. They scatter the dirt over a wide space and make runways through it.

ALBERT. Since the rain all kinds of bugs and other insects are out hustling around. The ground will soon be green again, and they'll all be happy—sow bugs, spiders, insects and all.

KENNETH. Spring is coming, for one of our ants brought out a weed that had sprouted in the house.

CHAPTER XIII.

January 27 to April 20.

Carpenters, Harvesters, Other Insects. The Rainy Season.

FLORENCE. At last, at last! We've found the nest of the big Carpenter ant. We've been hunting for it for seven months, and have been running over it every day. We were told we would find it after the rains came, and that we would be surprised.

KENNETH. Yes, I've found seven colonies on this back yard today. Doesn't that beat you? They carry dirt just like ours do, only their earth pellets are larger.

FLORENCE. No wonder we couldn't find the nest. The only sign is a half-inch hole in the ground, except when they are mining.

CECIL. There are about fifty kinds of real Carpenters, but some other ants live in wood and may be called Carpenters—some kinds of Acrobats, for instance.

FLORENCE. But it seems strange that a Carpenter will live in the ground.

CECIL. Even men and bees will live in the ground if it is the best place they can get. Several kinds of Carpenters in dry countries extend their nests down tree trunks into the ground to moist earth or to water. This one does, and even builds altogether in the ground, around this place.

FLORENCE. But their big jaws were really made to gnaw wood with.

CECIL. The Carpenters live almost everywhere. They build under stones or other objects, in soft or hard wood or bark, and even in the ground. Instead of building a nest, a colony may live in an oak gall or oak ball, in a dried bean pod, in a nest along with other ants, or in one made by another insect.

FLORENCE. They're not very hard to please.

CECIL. They may build paper houses in trees, as does the hornet—may even build mud houses in trees.

FLORENCE. I read that some kinds hold their babies in their jaws, and then use the babies as shuttles in spinning and weaving silk with which to bind the edges of leaves together for a new house. As many as a hundred ants may work at this at a time.

DOROTHY. What do their babies eat? You know, we saw the ants carrying some flies home.

CECIL. They eat almost anything from honeydew to the pith of trees.

FLORENCE. These ants liked the honey and cooked apple that I gave them, but carried the squash seed far away.

CECIL. A Carpenter has been known to go nine months without food.

KENNETH. January 27th, and it has rained an inch within the last two days. Soon after the last rain, January 12th, our ants finished mining and closed up their doors tight for winter.

CECIL. And this rain has smoothed their doors over until no one would imagine a thousand or two of ants below. There's no sign of a nest. These Carpenters commenced mining as soon as ours quit.

KENNETH. Several of the Acrobat nests are on low ground and the workers are stiff with mud and cold, but

they won't give up. Their masons built a fine wall by the doorway. The ants remove a stone when they want to go out or in.

FLORENCE. I find the Carpenters do their mining after dark, so the birds and I won't see them. One of the colonies is building in dry ground and is carrying the dry dirt out in basketfuls (jawfuls) instead of making mud balls of it.

CECIL. Those that live in wood have some members with very large heads that make handy doors. Some kinds keep large herds of other insects in their nests.

KENNETH. And many have new queens only every two or three years. A completed colony is likely to have about 2,000 ants. These around here must not be complete yet.

ALBERT. The Carpenters are the largest ant, but I see that some are several times as large as others, even in the same colony.

CECIL. The books say it would take a hundred of the smallest kind of ants to equal one big Carpenter in size, but I think it would take five hundred. The largest Carpenter is over a half inch long, and the dwarf ants we found are less than one-sixteenth of an inch in length. I figure that the Carpenter is five hundred times as large as one of these.

FLORENCE. Hardly. Think of one man weighing two hundred pounds and another only two-fifths of a pound. Some dwarf!

CECIL. Why, the queen of the Dwarf ants we found is a thousand times as big as one of their workers. Some female spiders are fifteen hundred times as large as the males.

DOROTHY. The Longlegs are mining, too. I gave them an insect and they dragged it indoors.

ALBERT. The sow bugs are out, too, and having a high old time.

DOROTHY. Well, we've had another half inch of rain, and all the ants that hadn't finished mining are happy. But ours are still housed up and have been ever since January 13th. Once in a while one will come out to see if everything is all right.

FLORENCE. I counted thirty-six of ours in the sun-parlor while it was raining.

ALBERT. The ants have made Kenneth's parlor two inches square since they use it for themselves instead of for their babies.

CECIL. Their rooms are ventilated through doors we can't see. Then the damp walls would take up some of the bad breath.

DOROTHY. Some of the other Harvester colonies are mining today. Their outer doors were so big they couldn't close them if they tried.

KENNETH. I exchanged my glass roof on the sun-parlor for a tin one. One night there were several ants in the room when it was raining. I guess they liked to hear the rain on the roof.

ALBERT. One day after a heavy rainfall, I lifted up a stone and there lay one hundred and fifty Carpenters in the mud. They looked like tiny horses lying down on their sides asleep—even their heads were lying on the ground.

CECIL. They may have been asleep or just dormant from the wet and cold.

ALBERT. After the sun shone on them five minutes, some began to wake up and these soon rooted around among the others. In a little while all were awake and ran down a hole.

DOROTHY. I suppose it was too late in the season for babies.

ALBERT. Yes, but one year in late November I saw the same kind of a thing, and that time there was a bunch of babies stuck together and lying in the mud. An ant grabbed the bunch and took it along. Of course, the nest had been flooded and the ants had climbed up out of the water.

FLORENCE. I wonder if they didn't take cold?

ALBERT. That time I lifted the stone twice a day for three days, with the same result each time, and still the mud hadn't dried under it.

FLORENCE. Did you ever learn how long ants sleep?

CECIL. About three hours a day. Some may work while others sleep. Sometimes the workers run over those ants that are snoozing and jostle them around, but the sleepy ones don't make as much fuss about it as you would. The big-headed ones are the most sluggish and hardest to wake.

DOROTHY. How does an ant act when it wakes up?

CECIL. Just like you do—yawns, opens its jaws, sticks out its tongue, stretches its legs, bathes and combs.

ALBERT. One night the seven colonies of Carpenters were all mining. When I would place my finger near a door, the ants would run away from home instead of toward it. They didn't want to show me where the nest was.

FLORENCE. They often hide their nests. They never clear the weeds away. We must remember where their homes are or we can't find them next summer.

DOROTHY. I saw some Carpenters and sow bugs exchange calls today.

CECIL. And yet these ants have two or three kinds of ammunition, and it may be acid, alkali, both, or neither.

KENNETH. I dropped a Carpenter on a snail and it got quite a ride before it could grab a weed and pull itself loose.

ALBERT. I dropped a snail on the loose dirt at the door of the Carpenters. It was twelve hours going seven inches, and then stalled. It quit when it had used up all its track material.

KENNETH. Yes, the war tanks were not the first to lay their tracks as they need them. The snail always does. The tank can pick its track up and use it again, but the poor snail can't. It hasn't a fair show.



Carpenter Taking a Ride.

CECIL. You see, the snail belongs in the water, but was bound to be a land animal, and so has to wet its track before it can crawl. The slime on the slug and snail may also be used to keep other animals away.

FLORENCE. Is the snail lazy, or just sleepy?

CECIL. Sleepy, I guess. In the British Museum a snail came to after being glued to a board four years, and then lived two years longer.

FLORENCE. As our ants won't come out, there's nothing to talk about, so go on about the snail or something else—sow bugs.

CECIL. As the sow bug is really a water animal, too, like the shellfish, it has to have damp air to breathe. So it

lives in damp places. Once I couldn't get water through our lawn hose and I found one end plugged up with sow bugs. The sense of touch is mainly located in its feelers, as are the senses of hearing and smell. It can taste, although it has no tongue.

ALBERT. It holds with its feet and tears with its jaws. Some kinds can roll up like an armadillo, but the ones around here don't.

DOROTHY. Since the rains, nearly every stone has several different animals living under it. I suppose many of them have been deep in the ground, where it is damp, through the dry season.

CECIL. I saw twelve Longlegs going in and out of a nest of sow bugs.

ALBERT. Well, it's the middle of March, and it's rained three inches within the last week—a regular flood that has done much damage. The earth cracks are full of water for the first time this year. All ants' nests around here are flooded except ours and Longlegs.

CECIL. The drowned will soon come to after the water drains off.

FLORENCE. Some sow bugs and snails were crawling along on the bottom of a puddle. A cricket jumped into a little pond, but was a fine swimmer. He is my pet cricket, even if he is a cripple, and has but one big leg. I know where he lives.

KENNETH. Those you saw were slugs, but there are real snails around here, and they do much damage to gardens. Each carries its house on its back

FLORENCE. I put some walnut, almond and squash seed in the sun-parlor but was disappointed when I found thirty Acrobats in the room eating squash seed and only two of our ants were present. The Acrobats go into a neighbor's

house and take anything they want without asking for it. No wonder our ants don't return their calls.

ALBERT. What do you think? It's April 6th and our ants are laying eggs. I removed the tin roof quickly today and about 700 ants and six bunches of eggs, with about thirty in a bunch, lay before me. The ants grabbed the eggs and ran. I counted the number in one bunch.

KENNETH. I counted eight slugs that had run out of track material and were stranded on the sidewalk this morning to be roasted in the sun.

DOROTHY. These things have lived two weeks under a stone:

1 cricket—Florence's pet.
6 sow bugs—nobody's pets.
200 of the Dwarf ants.
Other animals often called as visitors.

KENNETH. Our ants are beginning to come out a little, but they're not working to speak of. I ran a straw through the closed door and pulled it out with two workers hanging to it. They let go and took some pieces of walnut into the house. Then other ants carried in all the rest.

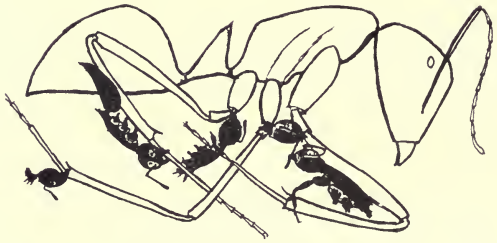
ALBERT. I want to prove the Acrobats are fighters. For some reason they don't want any other ant around the black acacia tree, but a big Carpenter got too close. My picture shows the result.

FLORENCE. Were the five Acrobats all on one side of the big ant?

KENNETH. No. Two of them had clasped the legs just opposite those shown in the picture. Although the Carpenter had killed these Acrobats, she soon died also. The jaws of E had closed on a feeler of D, by mistake, of course. The jaws of A, C and D had clasped the joints of the legs for good reasons. No Acrobat had tackled a foreleg. Wonder why?

CECIL. Our ants made their first trip on the trail on April 8th—about three months after they housed up for the winter (January 13th) and one month after they began to lay eggs. They are mining now, making room for the babies and young ants. The eggs are now hatching (a month later than last year).

FLORENCE. Some time ago you handled and counted



A B C D E

Five Acrobats Killing a Big Carpenter.

A—Head with one feeler.
B—Ant with one leg and one feeler.
C—Head and body with no legs and one feeler.
D—Head with one feeler.
E—Four legs and no abdomen.

a bunch of eggs that were in the second story of the sun-parlor.

ALBERT. Yes, and then the ants filled that room with dirt and never used it again. I removed one story of the sun-parlor not long ago.

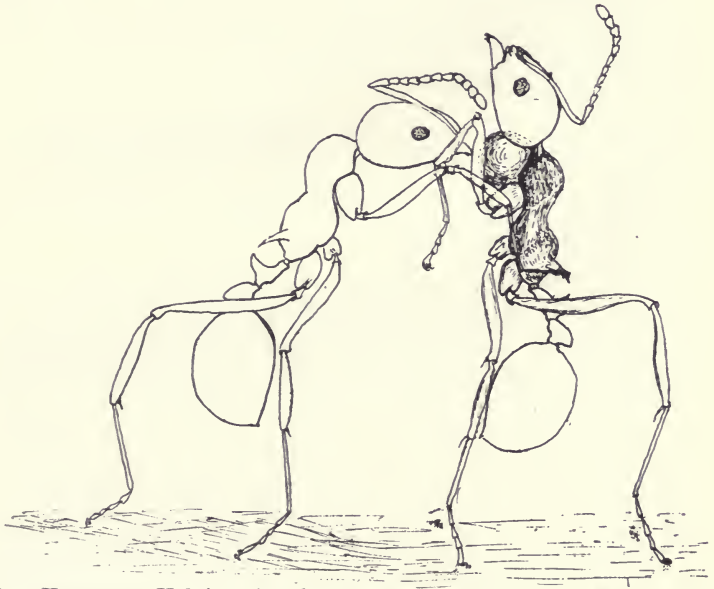
FLORENCE. One day you grabbed your umbrella and ran out to see what our ants were doing. They'd been caught out in a hard shower. They seem to like a drizzle, but this was different.

ALBERT. Those about the door didn't go in for a time. Those on the trail started for the door and a few reached it. A hundred crept under shelters. Some stopped on a

stone and were beaten down and gave up—lay under water without moving.

DOROTHY. And the others?

ALBERT. About twenty-five stood upright like a boy and kept still. After the rain those that didn't get wet ran home. Others waited until after the water dried out of their feelers, or until the puddles dried up.



One Harvester Helping Another to Remove a Drop of Water from Under the Throat.

DOROTHY. That's all, is it?

ALBERT. No. One of the upright ants had a ball of water under its chin and had trouble for half an hour. Its feelers would get tangled in the water as fast as the ant pulled them out with the comb on its forelegs.

DOROTHY. Why didn't the other ants help the one in trouble?

ALBERT. They did. A passing ant stopped, reared up, put its jaws on the drop of water, and some of it stuck, for I could see it glisten on the helper's jaws. Then two more ants did exactly the same thing, except I didn't see any water on their jaws.

DOROTHY. At last, what?

ALBERT. The ball of water was soon gone, the feelers combed out, and the ant went home.

KENNETH. They say the native Mexicans use ants as weather prophets.

DOROTHY. It would take a good prophet to prophesy a California shower.

ALBERT. Where have all the frogs and toads been since last year?

CECIL. Oh, they're all right. They've been asleep down in the ground, many of them—at least through the winter. They'll soon be serenading you again over at the pond.

ALBERT. But toads don't live in the pond.

CECIL. No, but they are now coming to the pond to lay eggs—coming from as far as two miles. Slow journey. A toad will walk a few inches and then stop to rest. Sometimes they travel on the dangerous highway. When the celebration is over, each toad leaves her tadpoles to hustle for themselves and plods her weary way back to her old home.

White Ants, or Termites.

FLORENCE. I set an ant-like insect down on the ground and she walked away from her wings. I saw another one leave her wings in a knot hole the other day. She seemed to wipe them off with her legs. She could curve her abdomen up over her back, too.

CECIL. These were white ants, or termites. They're not real ants at all. They have wingless workers and soldiers. A soldier has a head nearly as long as all the rest of the insect. The larvae are called wood worms because they live in wood, but I don't know where these around here live.

FLORENCE. Have you seen any of these white ants?

CECIL. Once in November I saw a dozen colonies swarm, and they came out of earth cracks on the school ground or along a bare footpath. Some of the soldiers and workers were out to encourage the winged royalty to make the venture into the sky.

KENNETH. A colony of Robbers came up near the swarming termites, but left because a lot of children came running up. I'd like to know why these White ants made their nest in such bare, hard-packed ground. On the school ground—of all places!

Ant and Florence. Eyesight.

FLORENCE. Well, Ant, it's some time since we had a chat. You jumped a half inch again, when I dropped a Carpenter near you. I suppose you screamed, too.

ANT. That ant is eight times as big as I am and you are 2,000 times as large as a mouse that can make you scream and jump onto the table. If you had the muscles of a flea you could jump two miles. Let me see you spring twice your length. I jumped twice mine.

FLORENCE. Flies don't get closer to you than half an inch when you are both eating sugar.

ANT. Sorry, but I can't say so much for you.

FLORENCE. You are eight times as big as the Garden ant, but it can run twice as fast as you.

ANT. There goes a rabbit. Let me see you catch it. Why, you can't catch a flea.

FLORENCE. You know the African Ant Lion has a neck twice as long as its body. Well, yours is too slim, but it's not as long as that ant lion's.

ANT. My neck is all right. See? I can turn my head sixty degrees to the right or left. You think you can turn your nose around even with your shoulder, but you can't.

FLORENCE. You just think you are smart.

ANT. You just think you know as much as your parents, but I've always known about as much as mine ever since I began to do regular work. Why, the first time I tried to work I did it about as well as I do now.

FLORENCE. It must be great to be born wise.

ANT. Don't you wish you were an ant? Then you wouldn't have to go to school at all.

FLORENCE. I wish you would stay out of our cupboard.

ANT. Not guilty. Our ants never bother the home of man. But why do you object? Down in some parts of South America the people welcome a drove of ants—even move out to let them clean house. Yes, they even let the ants clean their clothes of vermin.

FLORENCE. Thank you. Our house isn't in need of any such visit.

ANT. You are quite willing to visit our home, but don't want the visits returned, it appears.

FLORENCE. You try to deceive me. Sometimes you pretend to sting me when you haven't any stinger at all. I even doubt if you have any formic acid, and a stinger without poison would be like a gun without a bullet.

ANT. What did you paste one of our ants down with cooked squash for?

FLORENCE. When I did that a hundred ants jumped and ran in every direction, as if hunting for the enemy,

but not one helped the captive to escape. Finally it got loose itself.

ANT. Don't you think we always play fair?

FLORENCE. I don't know about that. One of your ants bit the feet of another, took a seed away from her, and carried it home—maybe to get the credit.

ANT. I can't make out whether it is a case of nerve or nerves with you.

FLORENCE. Your claws are no good for you often slip off that smooth stone by your door. Why not take a course of ten lessons from the fly?

ANT. Of course, mining wears out our claws and the oil and wax on our feet don't stick very well to dusty walls. But I can walk up clean glass, as I've told you before. You've seen me walk up the inside of bottles.

CECIL. Judging from your fine looking eyes and the splendid wings of your kings and queens, ants must have lived outdoors some time in the dim past, and all had wings. But with touch and odor, maybe you can now get as good an image of an object as you once could when your eyes could see.

ANT. Keep on talking, if it will make Florence stop.

CECIL. How do we know but ants have flashlights or lanterns in their feelers? We don't use the same part of our eyes in a darkened room that we use in strong light. I went to the movies today, and was blind to objects in the room for a time. Then I could see everything. The images had to be shifted to new curtains in my eyes before I could see, and it took time. There's a lot that man doesn't know yet, even about himself.

CHAPTER XIV.

April 20 to June 13.

Our Ants Have a Second Battle With the Eyeless Robbers.

ALBERT. I'm glad you're all here. Last evening Florence, two other persons and myself visited our ants to find them having another awful battle with the eyeless Robbers. You know they killed many of ours in driving them away from the telephone pole.

FLORENCE. The Robbers came in overland and the fighting was done on top of the ground this time.

ALBERT. It was one of the most wonderful sights I ever saw. Our 2,000 ants piled themselves up in two embankments reaching clear around the door of the nest. These circular banks of ants looked like two black ropes stretched around the door—one inside the other.

KENNETH. I've read of men throwing up banks of dirt in battle, but not banks of men.

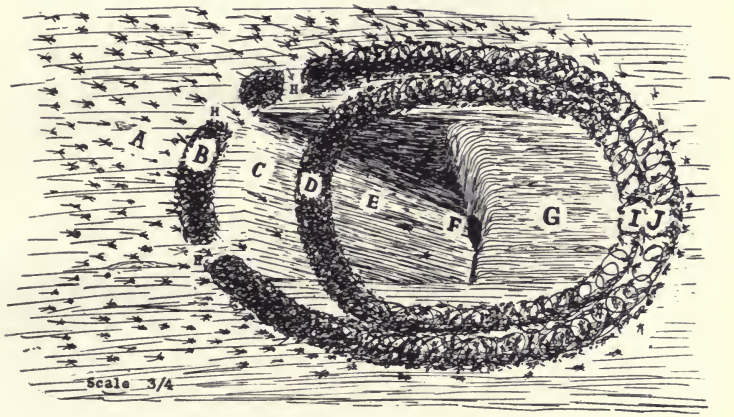
ALBERT. These ropes of ants were over half an inch high, where the shock attack was made on them, except at three points in the outer wall of ants. At these points three gates were left open for some reason. These gates made me think of ambush, traps, shortage of ants, way of escape with babies, division of work between the two lines of battle, bad generalship—but I didn't discover their cause or use.

FLORENCE. Only a few Robbers went through the gates. I guess they didn't know about them. I think our

ants made their circles a little too big or too high, and so ran out of ants.

ALBERT. Ours didn't go after the Robbers, but would wait until the enemy would run into the rope of ants. Then ours would pull the murderers into the wall of ants and smash them—a dozen of ours against one of theirs, you see.

FLORENCE. No Robber could reach the door without



Battle Between Black Harvesters and Robber (Ecitons) Ants. Diagram. June 3.

going through or over two banks of our ants, and very few could do so. Great scheme on the part of our ants, wasn't it?

FLORENCE. Albert, you explain my picture.

ALBERT.

A—Robber ants (Ecitons) in great numbers making an attack, their object being robbery, murder, and especially kidnapping babies.

B, D, I and J—Black Harvesters that have come out

of their nest and built two circular walls of their own bodies. They seem to need reinforcement at H. There are about 2,000 ants in these walls. Notice this plan amounts to a first and second line of defense.

C—Quite a number of Robbers reached C, but very few got as far as E, F, G.

F—The doorway. H—The three openings in the outer wall, use unknown. This battle was a sight, and I suppose one not often seen. What general gave the command for the formation of these embankments of blind ants, and for the distribution of ants?

FLORENCE. There was no panic, no haste in using jaws, no undue excitement on the part of our ants. They would injure themselves worse than the enemy by a reckless use of their strong, grass-hook, scissor jaws. Do you see that this would be so?

ALBERT. Ours seemed to keep their feelers buried in the banks of ants.

FLORENCE. There were many more of the enemy than of ours, but an attacking ant had to run through or over an embankment of ours before it could get to the door. See the idea? I'm proud of our ants. I thought they were farmers and hadn't studied out any plans for a battle. Let's make them a flag and keep it hoisted on their battle grounds.

ALBERT. It was great to see so many of the enemy moving into the bank of ants to disappear. But finally a few scaled the walls and entered the nest. It was so dark we could hardly see and we became more excited than our ants, fearing the babies in the house were not guarded and would be kidnapped.

FLORENCE. Yes, and then we jumped on the enemy and tramped a lot of them to death—maybe five hundred.

This caused the Robbers to stop the attack, and, as it was dark, we skipped for home.

CECIL. Then you don't know how the battle ended?

ALBERT. Yes, we found that out this morning when we saw our undertakers carrying about a hundred of our ants to the cemetery.

DOROTHY. And not a Robber killed?

ALBERT. Not so fast. Ours had piled three hundred dead Robbers in a circle around the door.

DOROTHY. Good news from the front.

ALBERT. And that isn't all. They are still working at it, and have now piled nine hundred bodies of the enemy in a circle around the door—all that we killed and all that they killed.

FLORENCE. Yes. The dead were so thick on the ground that their legs got tangled and one of our ants could carry a whole bunch at a time. Great fun. Sometimes an ant would pick up a bunch of Robbers that didn't need moving, stick her head up in the air, and trot around for sport.

ALBERT. Several days now since the fight. Ours close the doors with dead Robbers through the heat of the day, and pile them in a ring around the door at night. Owing to the wind, hungry animals or something, the number of bodies is gradually growing less (200 still remained a month after the battle). Maybe our ants are eating them; I don't know. Their bodies don't fall to pieces for some reason, as do the bodies of our ants and of the Carpenters.

KENNETH. What in the Sam Hill did our ants pile nine hundred dead Robbers around the door for?

CECIL. I don't know. But if the Robbers should send a scout down to that door to investigate, would it be likely to advise another attack? Not on your life.

ALBERT. As I just said, maybe the bodies are kept for food. Moulds and bacteria don't seem to attack them. Ours carry home the bodies of the Carpenter and other insects for food. Why not eat the Robbers?

DOROTHY. Why may the bodies not be left for little Horny, so he won't eat ours—or be left as scarecrows?

KENNETH. Another colony of Harvesters has been driven from home or moved of its own accord, and the Longlegs have moved into the vacated nest, same as they did when ours were chased from their nest at the telephone pole.

DOROTHY. Ours never piled the Robbers anywhere but around the door, except once when they put a hundred of them in a can lid for a day.

FLORENCE. The next morning after the battle I saw two winged queens and eleven kings walking over the battlefield. Once before I counted eight of our winged queens and thirty-four kings that were out on the yard taking exercise. I saw the first winged Harvester queen in May. It was two months after we saw the first eggs—time enough to hatch and grow up.

KENNETH. Sometimes, I suppose, a single ant may start a battle that causes the death of hundreds.

FLORENCE. How about man? Only it's millions of deaths, instead of hundreds. Ant or man may start a battle without any good cause. Ants have civil war, too, the same as man. Judging from ants, it'll be a long time before we learn to do without war.

ALBERT. There's this difference in the battles of ants and men—the soldiers of ants never rebel and overthrow the government. When food is scarce, the workers of some ants are not afraid to eat their soldiers.

KENNETH. I suppose an ant wouldn't trade its jaws for a war-club, battle-ax and sword.

CECIL. I wonder if the ants and cannibals that attacked Stanley's men in Africa didn't each do so for the same reason? Stanley says that ants kill monkeys and snakes, and "our fowl and pigs."

DOROTHY. Some of our ants were wounded and some killed in the late battle. I wonder what an ant would do with an injured limb?

CECIL. I don't know, but a pet chipmunk in Sacramento skinned its tail on the wires of its cage. The bone stuck up like a red wire. The munk looked at it, didn't like it, and then bit it off. After that they called him Bobby.

KENNETH. About dusk today I saw a line of Robbers crossing a trail of Harvesters like ours. Neither paid any attention to the other.

Queens, Eggs, Nests, Acrobats.

FLORENCE. How many queens in an ant colony, anyhow?

ANT. The number varies from one or a few to hundreds.

FLORENCE. Your queens are quite lively. I have seen them at work a number of times.

ANT. Why, some ants even let their queens go out on the trail with their workers.

FLORENCE. Once last fall a quarter of an apricot lasted your ants three days. I saw a king hold its mouth to that fruit for three and a half minutes and then drink some water for two minutes.

DOROTHY. Yes, and I saw a queen drink for a minute. I thought kings and queens had to be fed and watered by their servants.

FLORENCE. If you have eggs in the house about all the time I should think you would get the old ones and the new ones all mixed up—and the old and new babies, too.

ANT. We can tell all about our old and new babies and eggs when our feelers touch them (contact-odor). So we keep those of the same age piled or stuck together, whether we keep different ages in the same closet or not. Often we stick eggs of the same age together in bunches and the babies, too, sometimes.

FLORENCE. Like our teacher. She doesn't get the different classes mixed.

DOROTHY. Why do some ants cover seeds with saliva before feeding them to babies?

ANT. Why do the women of some countries chew food before giving it to their babies?

DOROTHY. You are blockading your door with stones today for a change.

FLORENCE. A dozen injured Acrobats were left at your door and their sisters began to rescue them. Some of our ants stepped too close and the jaws of the injured ants clinched the legs of our ants. Ours cut their heads off, but that didn't do any good.

DOROTHY. Your nest is so close I'd think you'd smother.

ANT. Why, you can name a number of large animals that have homes in the ground.

Mining, Trails, Work.

FLORENCE. Some of your closets have low ceilings. Can you lie on your side while mining?

ANT. Yes. Even stand on the ceiling if I want to. I use my claws and jaws mainly in mining.

FLORENCE. When we first found your colony, you had

mined about a gallon of dirt. How long would it take you to do that?

CECIL. Let me tell you. A gallon would be about 500,000 loads—500 loads apiece for a thousand miners. Maybe fifty days' work if the dirt be dry and the mining hard. But if the ground be wet and soft, the ants could make earth balls much easier and carry out a gallon in a few days.

ANT. When the earth is damp, we stick about a dozen scraperfuls (jawfuls) together into a ball or earth pellet, and carry it out. When the dirt is dry, we don't go to that bother, but carry it out loose in our baskets (jaws). We'd soon run out of saliva if we tried to stick much dry dirt together.

FLORENCE. Every night you knock the pellets off, making a trail through them in the direction of your seed field. They crumble easily. How many trips did each Harvester make last night?

ANT. I don't know. Ants were on the trail sixteen hours. Say, five minutes going, the same time finding a seed, and twenty-five returning home.

CECIL. I suppose they work in shifts, and don't work overtime unless there is a reason for it.

FLORENCE. I notice the ants don't work outside during eight hours in daytime; at least, in hot weather.

ANT. And I notice that you don't work outside during eight hours at night, in any kind of weather.

FLORENCE. The boys sleep eight hours at night, and as much longer as possible, and eat three times a day, and as much oftener as possible.

KENNETH. Our ants have a rule not to work through the heat of the day, but they break it when there is a rush

order for a new home, when a new grain field is discovered in famine times, and when war is threatened.

Longlegs, Food, Instinct.

ALBERT. The Longlegs don't seem to annoy our ants except after ours have had a battle or other hard luck. Neither do ours bother them. Still, I once saw six of our ants and six Acrobats enjoying a piece of fruit on which two Longlegs lay dead.

DOROTHY. Our ants wouldn't eat some cheese until two days after I gave it to them.

CECIL. Once a squash seed wouldn't go in a small door, so the ants pulled it out and took it around to a large door.

KENNETH. And once a large seed got stuck between two stones and the ants pulled it back and took it around another way.

ANT. People call this instinct when I do it and intelligence when you do it. Much of what you call intelligence is instinct, I guess.

CECIL. As I was sprinkling the lawn last evening, I threw some radish tops on the cement walk. When I removed them this morning there were the five hundred Fire ants we found stranded on that cold pavement one morning. They grabbed their three hundred pupae and rushed to safety. I suppose some of the water had gotten into their nursery.

FLORENCE. I poured some water on the ground and 2,000 ants came out to drink again. Albert came along, bent over the ants, and whispered: "Get into the house, quick, or the Black Man will get you—all of you—quick!"

CECIL. Ha, ha, ha!

FLORENCE. They all rushed for the door at the same

time, and there was a panic. They couldn't get in and the 2,000 ants piled up an inch high. Albert won't tell how he did this.

CECIL. He simply blew his breath on them a little. They knew they were running an awful risk to expose their whole colony to some enemy at the same time, and so were easily thrown into a panic.

FLORENCE. The Carpenters would never run such risks.

Carpenters.

DOROTHY. Well, look at that Carpenter Albert has caught! It's pumping balls of honey-dew from its craw back between its jaws and the boy is actually eating them.

ALBERT. Why, you eat honey, don't you, after the bees have swallowed it? I'm playing Indian.

DOROTHY. I saw a big Carpenter dying in a rose bloom and a wounded bee lay helpless in another a few inches away. Draw your own conclusion.

CECIL. While the Carpenters always leave home one at a time and travel alone, I have seen as many as fifty come out of the house in a minute about dark. Once I lifted a can lid about dusk, and twenty of them were under it.

FLORENCE. A few Carpenters ventured out of the house today and some small chickens captured them.

KENNETH. Within the last year I have seen a colony of Carpenters carry home in daytime a dead sister, a sow bug, two flies, a maggot and a chunk of dirt. Most of this was for babies, no doubt, as they eat almost anything.

ALBERT. One morning I found a dozen wounded Carpenters on the garage floor. Many were helpless. Very few could run and hide. I think their colony had been

attacked and whipped by something, and, of course, my guess is Robbers, as they will attack any other ant.

CECIL. Those driven from home make me think of "The Man Without a Country." The number of wounded ones make me think of the many dangers of ant life.

When Ants Are Killed. Health Officers. Inspectors.

DOROTHY. You don't pay any attention to ants that are run over in the alley by autos, yet you will work for days to rescue the body of a sister from the nest of some other ant. I guess you have gotten used to the deaths that happen by accident. I suppose you have babies enough to more than take the places of those that are killed.

ANT. As many die or are killed as are hatched, or else there would soon be too many Harvesters on earth. There are too many of some kinds of ants now.

FLORENCE. I suppose you have health officers, you're so particular about keeping everything so clean?

ANT. Each ant is a health officer, and helps clean up itself, other ants, and the house and premises, without being driven to it by health officers, doctors, teachers and street commissioners, as you must be.

FLORENCE. Sometimes you seem to have inspectors at your door. Several times I have seen ants stopped and their loads examined. Some of the loads were then carried into the house, but others back on the yard.

ALBERT. Yes, and sometimes the examiner and worker couldn't agree, for one would pull this way and another that. They are just as likely to disagree over an insect as over a seed.

Preparing for Another Battle. Clearing Grounds.

CECIL. Do you know that I think our ants are fixing to move again or are getting ready for another battle with the Robbers? They are acting in a strange manner.

FLORENCE. Yes. They have opened up a new door through which they can escape with their babies, and they won't carry in much of the melon seed I give them any more.

KENNETH. And they have quit harvesting.

DOROTHY. And they don't clean up their yard like they used to.

FLORENCE. I do hope the Robbers won't come again. It's a pity our ants can't have a home, a family, food, and live in peace on account of those thieves and kidnappers.

ALBERT. Ours are good workers, while theirs are bad robbers. Of course, plodding Harvesters stand a poor show when they "meet in battle those whose life training is a preparation for butchery."

ANT. Maybe this is as true of man as of ants.

DOROTHY. Talk about trouble! Think of our ants at the battle of the telephone pole! Sixty killed and others driven from home; babies stolen and stored away to be fattened and eaten; many lost and staying out in the weeds all night! It's enough to drive them mad.

FLORENCE. How our ants hated to give up that home, and kept going back to examine it! Once I saw one of ours carry another one back to the old home, and at another time I saw them carry sixteen from near the old home back to the new.

DOROTHY. At different times I saw a dozen or two walking back and forth between the old home and the new.

ALBERT. Then don't forget the second battle, in which ours lost a hundred more ants.

KENNETH. Something is going to happen again, I think. Our ants are commencing to build an annex two feet from home—over in the dry grass, weeds and sticks. Seventy-five workers are clearing seventy-five square inches of ground around the door of the annex.

CECIL. They need the cleared space for a dirt dump, besides these weeds would be a good place for the enemy



An Ant Leaning a Blade of Grass Against the Weeds.

to hide in. It's a rush order, all right, the way the miners are hustling. The ground is very dry and hard, too.

KENNETH. So dry the ants are not making earth balls, but carrying the dirt out in basketfuls (jawfuls). A basketful is the size of a small pinhead.

CECIL. Why this speeding up when mining is so hard, unless they have received a wireless message that another war has been declared?

KENNETH. It took our ants twenty-four hours to clear

seventy-five square inches of ground, and they have now commenced to clean up a much larger patch just outside of this. They first carry away all the loose pieces. It takes several ants to drag the larger ones. Those standing are pulled in different directions to break them off.

FLORENCE. Yes, and some pieces are so stiff they can't get them down.

KENNETH. Maybe they wet the bases of dry stalks to soften them, or put something on to rot them so they can pull them down?

FLORENCE. While clearing the ground of weeds, the ants couldn't remove a stout blade of grass that was very much in the way of loaded miners. A happy thought struck one of them. She took the free end of the grass in her jaws, dragged it around on the yard, climbed some weeds, and laid the end of the blade against them, as I have shown in the picture. You can see how she would have all kinds of trouble in performing this task.

The Carpenters' Cows Are Discovered.

CECIL. The cows, the cows, the cows! I've found the Carpenters' cows! I followed a Carpenter and she led me to the top of an oak bush as high as my head. Other ants were there and showed me several small herds of ant cows (aphids).

KENNETH. I saw them, too. The cows were young and giving no milk. The ants were just herding them and waiting. You ought to see the Carpenters go up the trunk of that oak bush at the rate of six inches a second. Their abdomens were no larger when they came down than when they went up.

CECIL. I have just followed another Carpenter forty

feet, and then up a small cedar tree. There the ants showed me several herds ranging from six to one hundred twenty-five cows each. One or two ants were guarding each small herd, and from six to nine ants each large herd. They averaged about one ant for seven cows.

KENNETH. I was with you. All ages were found among the cows. I saw an ant stroke the sides of a cow with its feelers until drops of honeydew appeared. Then the ant licked these up. The abdomens of the ants coming down the tree were five times as large as those of the ants going up.

CECIL. Yes. Their abdomens were stretched until the light showed through between the plates as the ants wabbled down the trunk with full milk cans (craws).

KENNETH. There were seventy-five ants and five hundred cows on the tree. An ant went up empty about every minute, and one came down full about as often. So it took about an hour and a quarter to fill a can on an average.

CECIL. It was all very funny. I saw a full ant stop milking long enough to put her mouth to the mouth of a discouraged sister and give her a taste.

KENNETH. Some ants were out of luck for their herds were bone dry. After coaxing a dry herd for half an hour on the trunk of that tree, an ant gave up and carried her can away empty. The cows didn't kick or anything, but seemed to enjoy the attention they were getting. They might have walked away had they wanted to.

CECIL. The ants herd these cows day and night, and have a branch nest, or hiding place, in the brush at the foot of the tree for daytime. I suppose they carry the milk home to the family at night.

KENNETH. We were expecting to find the cows of the

Acrobats, but were surprised to find that the Carpenters have cows on these bushes.

ALBERT. It was near this tree that we found the jaws of five Acrobats clinched on the legs of a big dying Carpenter. So I think we shall find the Acrobat herds near here, also.

KENNETH. I took a dozen cows to the nest of the Acrobats and the same number to our ants. All the cows were soon carried indoors, but whether for milk or beef, I don't know.

CECIL. A Carpenter was guarding a herd on the trunk of the cedar when a cow got killed. The ant soon discovered the body, doubled its abdomen under its body three times, and, I suppose, shot three charges of acid toward the cow.

ALBERT. How do you explain this?

CECIL. The cow was in a little trench where a scar on the tree trunk was healing over. I suppose the ant was gassing the trench, hoping to destroy or drive out the enemy that had killed the cow.

ALBERT. Maybe.

CECIL. After the acid gas had blown away, the ant jumped into the trench three times, snapping its jaws, hoping to crush the enemy. It had been watching over this herd a long time. Other passing ants paid no attention to the dead cow.

ALBERT. Was that all?

CECIL. No. The ant searched all around the herd looking for the enemy. It then examined the body of the cow carefully, got something on its feelers, stopped fifteen minutes to comb them out with its forelegs, jaws, chin whiskers and mouth parts.

FLORENCE. Our miners are still busy at the annex, day and night—not even stopping for the hot sun. They won't quit to eat walnut, and only a few will stop to drink. Busiest ants ever I saw. Guess they all know war has been declared.

CECIL. There isn't room for all the ants to mine, so about half of them stay at the old part of the home. Maybe they work in shifts. They have finished clearing the ground around the annex, but it's plain the annex itself is not done yet.

DOROTHY. The ants that are not mining are not working. They just walk around as if dazed. I hope they will win the battle again if attacked. If we only knew when the battle is to take place our ants would win. Well, I hope they will get the annex finished in time. Here's to their success.

CHAPTER XV.

June 13 to June 17.

A Third Battle With the Eyeless Robbers.

ALBERT. (8:30 A. M., Tuesday.) The eyeless Robbers, the eyeless Robbers, the eyeless Robbers are here again! Help! The war is on. They have killed 250 of ours and not lost one of theirs. The battle is about over, for ours are beginning to run. They may have been fighting all night.

DOROTHY. These Robbers killed sixty of ours in November and a hundred a month ago. Add the 250 they have now killed and you have 410 of ours that we know the Robbers (Ecitons) have murdered.

CECIL. They must have sprung a surprise on ours this time, after all—before ours had time to form in two embankments around the door as they did a month ago. And this time a part of our ants were in the main building and a part were two feet away mining at the annex.

ALBERT. The battle is too near over for us to be of any use, but see these fight. Here are twelve bunches of fighters. In each group about five of the Robbers are attacking one of ours. See the bunches roll to the bottom of the grade.

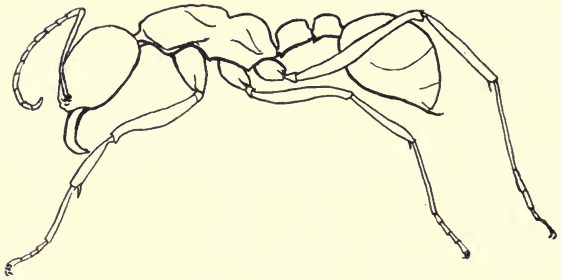
CECIL. Small ants are very brave when in large numbers.

ALBERT. Look! One of ours is tackled by six of the

enemy. She has lost one feeler and there goes the other. She tried to hide them, but failed, and is left to die.

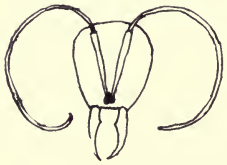
KENNETH. See ours hike away from home. They are running thirteen feet and hiding in a cave by the telephone pole. The Robbers drove them away from the other side of that pole seven months ago.

FLORENCE. I've drawn a picture that will show you what this Robber looks like.



THE ROBBER ANT.

(Eciton (Acamatus) opacithorax Emery.)



Front View.

FLORENCE. What do you think of my picture? Look at the jaws. The length of this ant varies from one-eighth of an inch to twice that, and the length of the jaws varies more than that. A soldier's head isn't large, but the jaws are fierce.

DOROTHY. This is the villain in the story—the one

who murdered 410 of our ants and kidnapped and ate the babies. If ours had given up the babies without a fight, they wouldn't have lost an ant.

CECIL. I see that about one in six has a barb, spine or something at the end of the abdomen.

KENNETH. One book says that Ecitons attack above ground generally. These did the second and third time, but I think they attacked under ground the first time. At least our undertaker or something carried forty dead Robbers up out of the nest after the first battle.

DOROTHY. Look! There goes one of ours carrying a queen, and several of the rescue squad are packing away some of the rattled ants.

FLORENCE. Rattled! Maybe they've been gassed or wounded. This isn't the first time we've seen our ants try to rescue their wounded from other ants.

KENNETH. Ours may have carried away their eggs, babies and queens when the battle began, but they wouldn't have time to save their grain. But the Robbers got the babies if they could, and as they won the battle, I fear they did so.

DOROTHY. The enemy has moved into both the old parts of the captured house and the new.

ALBERT. Just look at the feelers of our 250 dead ants lying around here. The murderers know how to make an ant helpless, it seems.

CECIL. Yes. An insect's feeler is the most sensitive organ in nature, I have read. A bat's wing comes second. An ant's brain is spread out over its feelers; a bat's, over its wings, as I have said before.

ALBERT. A wild duck struck my wireless and fell down on the roof of our house.

CECIL. No danger of a bat doing this.

ALBERT. Did you notice that some of our ants were still dusty, as if they had left their mines and gone right into battle?

FLORENCE. The result of the battle might have been different if the annex had been finished.

DOROTHY. How can our ants get along in that one-room cave after living in a house with a place for everything?

CECIL. The same as man's bankrupt family, start all over again—all eat, sleep and live in that one room. Eggs, babies (maybe), kings, queens, 2,000 workers, guests—and only one bed.

ALBERT. It's but six hours since the battle, and our ants have gone to work. That's courage for you!

KENNETH. Yes, a battle in which ours lost their lands and home, 250 patriots, and probably about all their babies.

FLORENCE. Can't we help our ants get their old home back?

KENNETH. I'm going to pour seven gallons of boiling water into the new part of the house and one in the old. The Robbers are in there and must be thirsty after the battle.

FLORENCE. Why only one gallon in the old part?

KENNETH. So our ants won't have a half bushel of mud to carry out if they come back to the old part soon. Then, I suppose, they have their grain stored in the old part, and that I really ought not to pour any water in that. They can live in the old part while the new dries out.

ALBERT. Well, it's time for the funeral, isn't it?

FLORENCE. What funeral?

ALBERT. Here's a thimble with a penny for a lid. It isn't every ant that gets a copper casket. There, I've put

the 250 heroes into the coffin. Form in line and we'll march to the grave.

DOROTHY. The mocking-bird is furnishing all kinds of music, and that cricket is singing "Peace, peace, peace."

ALBERT. There! How do you like what I've written on the tombstone:

DEATH TO ALL TYRANTS.
Here lie the bodies
Of 250 brave ants that died
In defense of their queens, their government,
Their children, and their homes.

KENNETH. Ours are surveying their new ranch. Scouts go out in all directions to see the lay of the land, to learn of food prospects, and to locate trails—maybe.

ALBERT. Look at this undertaker. She has dragged a dead queen seven feet in the broiling sun over a bad road. The queen's hooked claws catch on everything. The ant works as if mad. It has carried the body by the mouth, a leg, the back, and now a wing has been pulled off.

KENNETH. Well, what about that? The undertaker has had heart failure, a sunstroke or something and has fallen over dead. Why didn't she leave the body near the cave door. I saw an ant overcome that way yesterday when the heat was 123 on the ground.

ALBERT. I saw that, too. The next ant that came along picked up the body and carried it into the shade of some saltgrass, and the sick ant soon came to.

KENNETH. Two other ants tried to help our undertaker drag the body of that queen just mentioned, but soon quit and ran to shade. I suppose that queen died as the result of the battle this morning. No doubt our nurses are having a busy day of it attending to the sick and dying.

ALBERT. These two ants have just been carried out of the cave to die. One has lost a feeler and the other a leg.

KENNETH. Here lie two dead queens and three wings by the door of the old home. Queens killed in battle, of course. I wonder if they were helping fight.

CECIL. Our ants are carrying in dry leaves and sticks. Maybe these are to be used in plastering up earth cracks.

CECIL. (4 P. M., Tuesday.) Look! Look! Five hundred of ours are moving their grain from the old wet home to their new dry den by the pole. Isn't that great? They'll not lose all their grain, after all. Hurrah, hip, hip, hurrah!

DOROTHY. They've been carrying grain now for two hours and are about done. I'm glad they saved it from sprouting, and glad the Robbers didn't get it if they wanted it, and glad there are not enough Robbers in the nest to keep our ants from going after their grain. Yes, I'm glad all over. You've been figuring. What have——

CECIL. Well, don't get excited. Quit talking if you want me to answer. Here's what our ants have carried from their old home that was captured by the enemy, to their new cave, in the last two hours:

87 carriers	caveward bound 48 times	equals	4,176 grains of oats.
87 carriers	caveward bound 48 times	equals	4,176 salt grass seeds.
26 carriers	caveward bound 48 times	equals	1,278 star thistle seeds.
47 carriers	caveward bound 48 times	equals	2,256 other seeds.
2 carriers	caveward bound 48 times	equals	96 loads of mud.
1 carrier	caveward bound 48 times	equals	48 dead Robbers.
250 carriers	caveward bound 48 times	equals	12,000

But it wasn't the same 250 carriers each time.

FLORENCE. The mud, the Robbers—explain.

CECIL. The mud may be used to plaster up earth cracks to keep enemies out. When our ants went back after their grain, they found forty-eight Robbers in the granary or elsewhere, and had to kill them before the seed

could be reached. Several times I saw our ants drag out a Robber and bite it through the big nerve under the shoulders until the enemy was stone dead.

ALBERT. Yes. I saw some of ours kill a Robber single-handed. Ours didn't lose an ant this evening, and the Robbers didn't lose one in the battle this morning. The enemy numbered five to one against ours this morning, and ours numbered five to one against theirs this evening. It makes a difference.

CECIL. The enemy killed ours this morning mainly by clipping off feelers, and ours killed the enemy this evening by crushing the bodies near the front legs. But the deaths stood 250 to 50 (48) against us for the day.

DOROTHY. I see ours have laid the 48 dead Robbers around the cave door, following their practice as seen after the battle a month ago.

FLORENCE. Say, I wonder if there is room in that little cave for 12,000 loads of grain along with the 2,000 ants.

KENNETH. I guess my 8-gallon Turkish bath this morning must have killed some of the enemy if only 48 were left this evening.

FLORENCE. We'll not worry any more about our ants starving. From your figures, they like wild oats and salt-grass best, and just look at the wild oats around here. You won't have to sow any, will you, boys?

DOROTHY. Twelve thousand seed kernels, six for each of our workers. I hope that hot water didn't wet the grain or cook it.

ALBERT. Each ant has about four times its weight in grain flour. This is enough to last some time if it takes me a month to eat my own weight.

DOROTHY. That would last all winter, if they would keep it till then.

ALBERT. (8 A. M., Wednesday.) Here's another "Hip, hip, hurrah!" for our ants this morning. You know they had the fight and were driven from their home yesterday morning and went back after their grain yesterday evening.

DOROTHY. Yes.

ALBERT. Well, they worked all last night cleaning the mud out of the old part of the old home. They want it to dry out. I'm so glad Kenneth didn't pour but one gallon of water into that part.

CECIL. It's plain that our ants will move back to the old home soon—too soon, I fear. Better be here at four o'clock this evening if you want to be in time for the show. Good day.

ALL. Good day

CECIL. (Wednesday, 4 P. M.) Hello! You're on time, but too late to see it all. Our ants are lugging their grain all back to their old home. At first 500 ants came out of the cave, and walked back and forth twenty minutes on the trail to the old home, carrying nothing.

DOROTHY. And why carrying nothing?

CECIL. To see that there was no danger along the trail, I suppose. Then it was just as we might have expected. The eggs, babies and one winged queen were taken home first. Other queens may have gone earlier. Three walked without help, but their wings were badly injured.

FLORENCE. How many eggs, babies and young, helpless white ants were there?

CECIL. I didn't see any young white ants and only twenty-three babies. So the young white ants and the babies may have been stolen by the kidnappers. I'm

afraid to tell the number of eggs, for I don't believe any one would believe me.

FLORENCE. You'll tell somebody, and you might as well begin on friends.

CECIL. There were about thirty eggs in each small bunch that an ant carried, and I counted 110 loads. This would make 3,300 eggs. My figures are low, for I'm sure some of the big bunches had fifty eggs in each.

DOROTHY. No wonder our ants are building an annex to their house.

FLORENCE. Were all the ants loaded with eggs or did some carry other things?

CECIL. There were about twenty guards to every egg-carrier. Of course, this included all ants that were returning to make another trip, for they would be guards also in case of danger—almost an army for each bunch of eggs. The few babies were carried along with the eggs.

ALBERT. By this time I had come up, and the ants were starting in to carry the 12,000 seeds back to the old home. They are making a mistake, for the grain will sprout. The nest isn't dry yet. But I suppose they are like I am—can't wait.

FLORENCE. Were there any guards with the grain carriers?

ALBERT. None, except the ants that were returning for other loads. Every ant carried a seed. Of course, they carried home the oats first—their largest and best grain, I think.

DOROTHY. Any trouble on the trail?

CECIL. Plenty of it. The trail led right across an old Acrobat home full of ants and with half a hundred kings and queens in it. Maybe you think the Acrobats didn't

kick. Ours made a straight shoot for home and didn't have sense enough to circle around this madhouse.

FLORENCE. Just like them.

CECIL. The Acrobats rushed out and tackled our carriers. Then about 200 of our guards surrounded the door of the Acrobats, piled upon the ants, and let the enemy gas and nip them.

DOROTHY. Hard luck.

CECIL. Ours snapped back, but not a single ant was killed on either side. Neither side was fighting to kill, or there would have been dead and crippled ants on the battle field. The Acrobats were just putting up a bluff. When in dead earnest their jaws never let go. Ours had to attend to them, so they wouldn't stop the trail of the egg-carriers.

DOROTHY. What about the egg-carriers?

CECIL. Oh, a good many climbed over the fighting mass or walked through the Acrobat jam and got nipped or shot. After the eggs were all home, the guards all left the Acrobats' nest except about a dozen, and they stood it out until all the grain reached home.

ALBERT. I suppose our guards piled upon the enemy and took all the punishment to keep the Acrobats busy and thus make the trail safer. I've seen our ants pile up that way in tackling a single big enemy and also when in battle with the eyeless Robbers.

FLORENCE. I know why our ants went into that cave instead of into their former home on the other side of that telephone pole. A colony of Longlegs were living in that former home, for I saw them moving out the same day ours left the cave. One queen of the Longlegs was twenty times as big as a worker.

ALBERT. Our ants lived in that cave just thirty-six

hours, and on the other side of that pole just six weeks, seven months ago.

DOROTHY. Well, say. When our ants got moved back, did they carry out any scalded Robbers? Did your boiling water do any good?

KENNETH. Yes, but they were so mixed up with mud that I quit when I had counted 300 dead. Maybe some escaped through earth cracks. There must have been earth cracks, for the nest wouldn't have held eight gallons of water. I guess they lost more ants than ours did, after all. You know they lost 900 in the second battle with our ants and 40 in the first, and we know of 348 this time, 1,248 in all. Not so bad.

FLORENCE. I suppose ants are like boys when in battle or in trouble—always have a leader, but nobody knows how or why.

CECIL. They act more like each ant is a leader and understands the whole game. No particular ones lead—different ones lead. For some purposes, scouts lead. They say that the robbers send out scouts before attacking in battle and in that case the scouts would lead.

DOROTHY. How about the seeds that the ants carried back to the wet nest? Did they sprout?

ALBERT. Yes, hard luck again. Most of the salt-grass and star thistle sprouted and have been thrown out on the rubbish heap. By carrying the oats out into the sun every day and back into the house every night, the ants are saving most of it. The pigeons haven't learned about it yet.

DOROTHY. A few weeks ago some of the grain sprouted. Four pigeons found that our ants were carrying it out

to dry, and came every day to eat it. Of course they tramped on our ants, too, and maybe did worse than that.

The Robber Ants Attack Another Colony of Harvesters.

ALBERT. Kenneth and I saw the Robbers attack another colony of Harvesters one evening. The Harvesters were nearly all out on the trail, headed for the harvest field. Thousands of the enemy marched in behind them, attacked them, and prevented their return.

KENNETH. A part of the Robber gang held the Harvesters about fifty feet from home, while others went back to kidnap the young ones.

ALBERT. But they had bad luck—there were no babies in the home, it seemed. Besides, a colony of Carpenters that lived but a few inches away learned of the danger, and attacked and killed several of the enemy.

KENNETH. The Robbers must have reported their failure to headquarters, for the legion filed off across the country to find another home to rob.

ALBERT. I wish you could have seen the thousands of Robbers march in files like soldiers, four to ten abreast. They seemed to move as one body.

KENNETH. Although they have no eyes, they have no trouble to follow each other as they march over new areas. Instead of following a scented trail, they give off an odor—not of formic acid—that enables them to keep together. They are great travelers—keep going on and on. Migratory.

ALBERT. Dead Robbers are to be found around the doors of many Harvester colonies. Wonder why the night scavengers do not gather them up like they do other dead ants.

Carpenters. Cows. Other Insects.

FLORENCE. How are the Carpenters and their cows coming on in the cedar tree?

ALBERT. All right, and it beats the world what I've seen. Why, I saw the cows shoot balls of honeydew into the air. Much of it lodged on the cedar leaves about an inch below. You ought to have seen the ants, flies and yellow jackets searching those leaves.

KENNETH. Yes, and if you get the sun right you can see the little balls glistening on the leaves. The Carpenters do their best to keep the other things away, but winged insects have the advantage. The balls dry up very slowly.

ALBERT. I saw thirty-seven Fuller's rose beetles, each guarding from one to four cows on the twigs at the foot of that cedar. Yes, and the ladybugs were there, too.

CECIL. The greatest hunter in that tree is the metal-colored wasp—the one that keeps flapping its wings all the time.

ALBERT. The greatest trapper in that tree is the spider. The many visitors make business very good. You know why the visitors come. Great sport. It's like fishing—always expecting good news from the other end of the line.

KENNETH. The spider is a cowboy, when it is roping an animal down; an architect, when it is building a suspension bridge; a weaver, when it is spinning a sheet; and it's a lot of other things.

CECIL. A panther, for instance, or a trapeze performer.

KENNETH. The spiders have made twenty-three traps near the cows in the oak bush, and are doing a good business. One has caught two Carpenters and a rose beetle.

DOROTHY. Now what are you doing?

KENNETH. This Carpenter was herding forty cows on this twig when I broke it off. I've carried it sixty feet, and the ant still attends the herd. I'll lay the twig by the door of our ants. Look at the Carpenter jump and snap at ours. Here come a dozen Acrobats, and away goes the Carpenter, but not until she had been shot at. The cows don't move on the twig.

FLORENCE. Some of the Acrobats are milking in the right way, some are in a hurry, and are squeezing the abdomens with their jaws, and others are biting the cows in two. Now the Acrobats are carrying all the cows into their nest.

KENNETH. The Acrobats haven't nerve enough to tackle the Carpenters at the herds up in the oak or in the cedar tree, even if they did chase this lone one away.

FLORENCE. Just think how this Carpenter stuck by her cows while you broke the twig off and carried it far away, and how that other Carpenter defended the body of the cow that got killed.

DOROTHY. Yes. The Carpenters defend their herds about the same as shepherd dogs attend theirs.

FLORENCE. I wonder what the Carpenters are getting on that sunflower?

ALBERT. They're getting something to fill their craws with from the skin of that plant or from the bulbs at the roots of the stiff hairs or from little sweet balls of sap on the bark that I haven't found yet. Besides this, they are herding cows on that plant.

FLORENCE. It's something sweet, I suppose, for I see flies, wasps, ladybugs, Acrobats, and other insects dining on that sunflower.

ALBERT. Yes, and, as usual, the Carpenters have an

awful time trying to chase these insects away. By the way, I saw one Carpenter feed another one again.

KENNETH. Several Acrobats were getting the best of a big Carpenter. I picked up the whole fighting bunch and dropped it at the door of our ants. A thousand of ours rushed out of the house and piled upon the fighters. I then drove ours away and laid the fighting bunch at the Carpenter's own door.

ALBERT. I saw you. Forty Carpenters, one by one, examined into the sad fate of their sister, but offered no help. Finally, one small, lank sister came along and tried to pull an Acrobat loose, but couldn't. She then doubled her abdomen under her body, and shot the enemy four times, but its jaws still held on. Finally, the Acrobat was pulled in two, but still the jaws held their grip.

KENNETH. By this time two other Carpenters had been gassed and knocked out, and the captured Carpenter was crushing the head of one of the enemy.

ALBERT. What are you at now?

FLORENCE. I'm bathing the feet of this Carpenter in alcohol. Poor thing. She got stuck in some pinewax on the cedar tree. See? She can run now, and I must take her home.

ALBERT. Alcohol!

FLORENCE. That wouldn't hurt her.

ALBERT. The cows were having another shooting match today. I suppose their bodies would be smeared with sticky honey if they didn't shoot it away. When a ball lodges on the cows they kick it away—play football with it. Sometimes a cow stands on her head when she fires.

KENNETH. The largest group on that tree now numbers 500 cows. A herd moves whenever it wants to. Generally they live about a foot from the end of the twigs,

but may live anywhere—even on the trunk if there is a scar with new bark.

CECIL. The ants take good care of their herds and are well paid. They do all the milking and try to keep other insects away from the dairy. Yellow jackets would carry off the calves to feed their babies, and ladybugs would eat the cows, and other insects would steal the honey and pay nothing for it, if the ants were not such watchful shepherds.

KENNETH. I suppose all children see plant lice (cows) on the weeds, garden plants, flowers and shrubs around the house. The lice are generally green or brown. They are called ant-cows because ants milk them. I found some white lice on the cabbage. After I rubbed their coats off they were green.

DOROTHY. I see the cows often shed their old coats for new ones that fit better. The cabbage leaves are covered with their old coats. I guess the "bloom" on the cabbage keeps ants and many other insects away. These cows don't need any ants.

KENNETH. But these cows give milk all the same. They kick the balls loose, and the wind blows them away.

CECIL. You ought to see them drill into the cabbage for sap. They stand on their heads, kick their neighbors, and give their bodies a twist. When the captain pumps, this causes a wave of kicks that passes out to the edge of the company. New stunt. Let's try it, boys.

KENNETH. Yes. They drill, or pump, by the pulse—once every second.

CECIL. Here's a cow with wings. I suppose she will soon fly away, and soon become the mother or grandmother of 5,000 new citizens. But the winged lice are not the only ones to lay eggs.

CHAPTER XVI.

June 17 to June 30.

The Velvet Ant.

FLORENCE. What's this thing I've caught? It was running towards the door of our ants. It's as long as a Carpenter, but heavier, wears an orange-colored velvet coat, has ice-hook jaws, feelers almost like an ant's, a body covered with short hairs, and the thing has an ant's foot with sharp claws for digging. Is it an ant?

ALBERT. It's called the Velvet Ant, but it isn't an ant at all. It belongs with the wasps. A girl brought me a big gray one from up the coast. The one she gave me looked like a small wingless bumblebee or a tiny skunk.

CECIL. I've seen three around here and two out in the mountains. They are common along the coast and in the warm, sandy parts of the United States. If you knew as much about this animal as I do you wouldn't——

FLORENCE. Ouch, it stung me! Quit your laughing. It doesn't hurt much. Tell us more about it. Ouch!

ALBERT. A university man gave me its book name as "Mutilla Californica." That's the little yellow one, but they are of various beautiful colors, and one big kind has long gray hair. They have several names: Velvet Ant, Cow Killer and Skunk Ant. You can tell they are digging insects by the way they can bury themselves in sand.

CECIL. The males have wings, but the females haven't. They don't live in colonies, but alone, like the cat. They

live in the nests of bumblebees, bees, beetles, probably ants, and with other insects, and their young eat the babies of their hosts.

KENNETH. I saw one breaking for the door of the Carpenter nest, and this one was going straight for the door of our ants, we thought.

ALBERT. There. I've dropped this one by the door. A half dozen of our ants have jumped on it, but it has escaped to be tackled by others. Look! It folds each feeler at the elbow and then presses it close against its head.

CECIL. And now it is standing on its head to hide its feelers, and the ants bite the small of its back. That's a new stunt. If our ants would take a few lessons, they wouldn't lose so many feelers when attacked by the Robbers. Do you know that some writers say that ants came from velvet ants and velvet ants from wasps?

Our Ants. Enemies. Other Insects Resembling Ants. Ants Carry Water. Cows. Acrobats Swarm. Crickets Are Watchdogs.

FLORENCE. Once last spring, early in the morning, one hundred and fifty of our ants climbed upon the level tops of some old dry grass. I wonder why?

ALBERT. To take a sun bath.

FLORENCE. Our ants have more friendly visitors than all other ants put together—Carpenters, Acrobats, Garden Ants, and even Longlegs. As they never return the calls, why do they have so many callers?

KENNETH. Because ours are farmers and hunters, and have plenty to eat. A good deal of food is left lying around the yard. Then our ants are good-natured, you know.

Ours don't visit the others because the others don't have anything ours want and because they wouldn't be welcome, anyhow. Visitors are so common that our ants expect them, and don't get excited when they have to provide an extra meal. There are not very many people that way any more.

FLORENCE. Does the honeydew come out of the two horns on the back part of the abdomen of a plant louse or ant cow?

KENNETH. No. Those two blunt horns are hollow and give up a sticky substance to protect the louse from ladybugs and other insects, but it is never used on ants.

FLORENCE. How can our ants find plenty of seeds where there seems to be none?

ALBERT. Didn't you notice last winter after the rains that millions of them sprouted around here? In many places half a dozen plants would spring up on every square inch. But sometimes they are hard to find, especially when buried.

FLORENCE. An ant sixty feet from home was trying to drag the body of a bee to the nest. I carried it home for her while she stood on the body and waited. Did she know of the time, distance and work I had saved her?

CECIL. Ask something easy.

FLORENCE. What insects resemble ants?

KENNETH. Some kinds of each of the following: Beetles, spiders, wasps, crickets, velvet ants, and termites (white ants). We told you once how to tell an ant from another insect.

FLORENCE. Do our ants care anything for honeydew?

CECIL. No.

FLORENCE. What kinds of animals capture ants for food?

KENNETH. Flickers, sparrows, woodpeckers, meadow larks (?), thrushes, young chickens, some wasps, ant lions, some spiders, toads, horned toads, lizards, ant-eaters, pups, some guests (eat the larvae), and even man himself.

FLORENCE. Does any kind of ant ever suckle its young?

ALBERT. Ha, ha, ha!

KENNETH. One species of Acrobats come near doing so from glands on their bodies above their hind legs.

FLORENCE. Can ants carry water home for the family or to dampen dry ground when mining, or to dampen ground that is too dry and loose?

CECIL. There is no question but some ants have been known to do this. The books say the ants may carry the water in their mouth pouches. I'd like to know why they couldn't carry it in their craws.

FLORENCE. We've seen a few of our crippled ants at work, but did any of you ever see a crippled Carpenter at work?

KENNETH.—Why, I saw two crippled Carpenters going to milk this evening. The one going down the sidewalk had lost a leg at the knee, and the one going up the cedar had lost a foot. Then I saw one that had lost both front legs on some no-man's-land trying to get home. Next, along came a Carpenter dragging a sister home by a feeler. A mean trick.

FLORENCE. We saw the Garden ants, Acrobats and the Termites (white ants) swarm, but I'm sorry we have to close the year without seeing our ants do so.

KENNETH. I saw the Acrobats swarm today, and so did Albert. Several dozen kings and queens were driven

from home. The workers would pull and push them, run over them, and bite their feet until they would fly away.

ALBERT. Some were willing to go, some refused and forced themselves back into the nest, others couldn't fly and were teased almost to death, and some ran away. The branch colonies had all moved into the main nest to help get the kings and queens off.

FLORENCE. What did you boys learn when you visited the man that lives down the canyon?

ALBERT. He asked me how ants get under a plate that sits on a flat surface, and I couldn't tell him. Then I asked him if he wasn't afraid and didn't need a watch dog. He said he had two of them—crickets.

FLORENCE. Crickets?

ALBERT. Yes. He says that one cricket at the front steps, and one at the back, sing all night, but always stop when anything comes near. He says if he had an airedale it would depend on the crickets.

CECIL. You know that rabbits skip out when the birds fly, and they say the moose runs when the moose bird rises from the brush.

ALBERT. The man said he put some kerosene on some plant lice, and they swelled up. Of course I didn't know why.

FLORENCE. When, according to the books, do robber ants make their raids?

CECIL. In the late summer or early autumn, and usually begin about four o'clock in the evening. The last raid made on our ants began in the morning, or else it lasted all night.

KENNETH. Our colony is not a large one, and it has been having such hard luck; it's not increased in numbers

lately. My guess is that within a few years the Robbers and horned toads will have destroyed it.

DOROTHY. The hot sun was too much for eight of ours this afternoon. They had to be carried home from the trail by others. Some had lost their minds and couldn't find their way, and others couldn't walk.

FLORENCE. Some of our ants must be old or have rheumatism. They're stiff. Many of them are carried out of the house.

ALBERT. They're nervous about something again. Last night at eleven o'clock guards were stationed all over twelve square feet. They stood about four inches apart, and were almost still. Once they rushed for the door, but it must have been a false alarm, as they all went back and took their stations again.

DOROTHY. Ours don't seem to raise any cows to bother gardeners and farmers, and never go into our houses. They do no harm that I know of. We think kindly of useful ladybugs. Why not of useful ants?

FLORENCE. Henry McCook spent many years studying ants and writing about them, as we know. He plants one stalk, root or seed for birds and insects, and two for himself. You see he is willing to divide up.

ALBERT. You have it wrong:

"One for the blackbird,
One for the crow,
One for the cutworm,
And two for to grow."

KENNETH. At first we thought our ants didn't make trails, but later we found them making very good ones. Then we thought they couldn't clear the ground of weeds around their house, but found we were mistaken. Next

we accused them of not climbing weeds for seed, but later Albert saw a hundred climb star thistle and gather ripe seed.

FLORENCE. It was only today that I watched one of ours climb a plantain weed an inch high and cut the six-seeded top off in ten minutes. Then another ant came along and dragged the head home. One time in March I saw a score of ants at this same work for several days.

Flying.

CECIL. I have just learned how fast some insects move their wings. The house fly flaps hers 352 times a second, and the honey bee 440. The bee must have small wings and stout muscles. After man had looked at these insects 6,000 years he saw how it was done, turned the propeller 1,400 times a minute, and he could fly, too.

FLORENCE. But which can fly the faster?

CECIL. Why, man can fly 100 miles in half an hour. Even the birds fly only about thirty miles an hour when not frightened.

KENNETH. As Cecil once said, ants lost their eyesight and wings when they were driven to living in the ground. Like man, they are now tied to the earth.

ALBERT. Are you certain that man is tied to the earth?

Ladybugs, Spiders, Daddy Longlegs, Oak Galls, Wireless, Cigarettes, Mites, Bats.

FLORENCE. Tell us a little about the ladybug. It is said there are 2,000 kinds.

CECIL. Never kill ladybugs. They live chiefly on small harmful insects, as plant lice and plant scales. When frightened, the ladybug draws her legs under her and a

yellow juice comes out of their joints. This is bad smelling.

KENNETH. They say there is a ladybug coming this way from Mexico, that is an awful pest.

ALBERT. I read of a state that shipped in several millions of ladybugs to help destroy harmful insects.

FLORENCE. I like to see her fly from the palm of my hand when I say,

"Ladybug, Ladybug, fly away home;
Your house is on fire and your children will burn."

DOROTHY. A girl from the ranch says she finds the cows this way: She holds a Daddy Longlegs up and says, "Daddy Longlegs, tell me where the cows are." Then he points the right way.

FLORENCE. They say that the crickets that live with some ants are about the size of a grain of wheat, that they play around the door like dogs, and that the ants carry them along when they move.

ALBERT. I saw a spider build a wagon-wheel trap, or snare, last night. It took her four hours. It would take a book to tell what I've seen spiders do. They are wonderful animals.

KENNETH. A spider the size of a housefly caught one of our ants, and I put them both in a small bottle, and laid it by the door. Another ant walked into the bottle, tackled the spider, took the ant away from it, and carried the body three feet to one side.

ALBERT. Yes. And then the other ant killed the spider, carried it away three feet, stopped to think, and the turned round and took it into the house.

KENNETH. Look at the little oak galls on this bush. Some of them look like rosy-cheeked apples. One hundred and fifty kinds of galls have been found on the oak.

CECIL. And each kind of gall is made by a different kind of wasp or gnat. She drills a hole in the leaf or stem, deposits her eggs, and the large growth of the plant at this point does the rest. Easy way to get a house built and to get food for the young ones.

FLORENCE. Yes, but I don't think much of the mother. She never returns to see what becomes of the family.

ALBERT. Some of the oak balls on these bushes are round and some are three inches long. It was in one of these that a boy found a colony of ants living—Carpenters, I would guess.

FLORENCE. I'd like to know why cats are so fond of catnip.

CECIL. Maybe for the same reason that some ants are fond of bug cigarettes. One book says that these cigarettes hairs are not in little pits, and that they may be found on almost any part of certain bugs.

FLORENCE. We don't know what animals lived with our ants except the little white mites. Something like a tiny locust and another like a tiny cockroach, or something, seemed to live with them, also. Oh, yes—and something like tiny spiders, too.

CECIL. We've often said that what one ant knows in a colony, they all know by a wireless we can't understand. But this is about as true of a flock of migrating birds, a school of fish, a hive or swarm of bees, and a march of army worms. But we've seen plenty of instances where our ants didn't all think the same thing—when ants disagree, for instance.

ALBERT. How can a bat in a dark room dodge a wire after it strikes it?—fly back and forth through the meshes of a screen without winging itself?

CECIL. Give it up. By what string is the hawk tied

to the bird it pursues? I guess other animals besides ants have a wireless, too.

After a Year's Search the Acrobat Cows Are Discovered.

KENNETH. Hurrah for me! I saw a hundred Acrobats climbing the black acacia tree that is about fifteen feet high. A few were coming down and their abdomens were three times as big as those going up. That gave me the clew.



A B

A—Cedar with plant lice herded by Carpenters.
B—Black acacia with cottony cushion scale herded by Acrobats.

DOROTHY. Well, hurry up and tell us about it.

KENNETH. They were not herding plant lice at all, but the Cottony Cushion Scale—one of the plant scales. The ants were using the insect for cows all the same. They were herding the scale just the same as the Carpenters herd the aphids, or plant lice, on the cedar, oak and sunflower.

ALBERT. I see the scale is about as large as a ladybug. From her under side she hangs a poke-like white egg-sack a half inch long and fills it with about three hun-

dred eggs. Then she stays on this sack as a roof and lays eggs until she dies. This scale does a lot of harm to trees.

KENNETH. When the ants stroke the mother and older children, balls of honey-dew appear. Within ten minutes I saw a cow give up four balls of milk to a brunette Acrobat while a blonde one waited for a fifth.

FLORENCE. One writer says he saw a plant louse give up forty-eight drops of honey in twenty-four hours.

KENNETH. But don't think an Acrobat can always get five drops in ten minutes, as I have just mentioned. Once I saw it take five hours to get one tiny drop, and that was the first milking I watched. I had a notion to help.

ALBERT. The Carpenters know better than to bother the Acrobat herds and the Acrobats know better than to bother the Carpenter herds. Sure death is the penalty in either case.

FLORENCE. The Carpenters go out alone and search all over shrubs and trees for cows. It looks to me as if they are better hunters than the Acrobats. They have plant lice herds on three plants while the Acrobats have scale herds on only one.

CECIL. But I think that either could defend a herd against the other after getting possession.

ALBERT. The Acrobats herd their cows so carefully in order to keep ladybugs and other insects away. The Carpenters do the same. A ladybug was eating a young plant louse one day, but a Carpenter soon put an end to the meal.

CECIL. Today three Carpenters ran into a trail of Acrobats near the acacia where the Acrobat herd is. One Carpenter escaped, but each of the other two soon lost a feeler. Nine Acrobats and two Carpenters was the death

roll after the battle was over. Yet, generally, these ants don't fight when they meet. Even a trail of our ants and the Robbers may cross without danger.

ALBERT. But look out if it's a defense of home or herds. Then it's a fight to a finish. There's no bluffing at such times—no nipping, but death gripping. Still, I've seen Carpenters, Acrobats, Garden ants, and even Long-legs visit the yard of our ants and stay for a meal—even eat side by side with ours.

KENNETH. I'm told that, around here, the Acrobats attend their herds the year round, but that the Carpenters omit winter.

CECIL. Of course, the Acrobats and Carpenters could swap herds and get along just as well as if they wanted to.

ALBERT. Say, the Acrobats have built fourteen stables for their cows in the scars that are healing over on the trunk of that acacia. One stable has fourteen cows in it. There's a tiny hole in each roof so the ants can get in and out, but the cows can't (October).

KENNETH. Maybe the cows won't want out until spring, for there's plenty to eat in the new bark of the scars. I saw some cows go into the stable before the roof was finished.

CECIL. I saw a calf squeeze through a very small door to get into the stable. I thought I'd help. So I placed a young cow in an unfinished stable. The ants bit it and promptly carried it out. Then I placed one just outside the door and the ants toted it in. Ants are as queer as girls.

KENNETH. The cows will stay in the sheds all winter, but the rain and winds may destroy the roofs. The young ones will grow, and by next May or earlier will lay eggs. Often I've seen as many as nine ants trying to milk one cow (scale).

ALBERT. A man told me the Acrobats will build stables any time of year, especially if cows are scarce.

CECIL. Some writers say the dried honey-dew of plant scales was the manna of the Bible, but that book doesn't seem to say so. But it is true that in Australia one person can gather two or three pounds of manna in a day. The Arabs call it "man" and use it for food. Sometimes it dries, peels off the trees and floats through the air like snow.

FLORENCE. I know of thirty-five Acrobats that built a shed in another acacia tree, but had bad luck. Some disease has killed all the cows, but the ants themselves have set up housekeeping in the stable.

DOROTHY. The bloom of the red-flower gum tree is cup-shaped at the base. I found from one to twenty Acrobats in nearly every cup. Many bees were flying around, but very few would enter a flower that contained ants. However, one bee made the venture, but got shot and fell to the ground paralyzed. But in a few minutes it recovered.

FLORENCE. That's something new.

DOROTHY. Six ants were in one of the cups. One clasped another by the back and held her while she gave up some honey-dew to a hungry sister, mouth to mouth. A second ant that asked for a hand-out was turned down cold. I watched this thing go on until I got tired and set the prisoner free.

KENNETH. Every evening for a week a band of Acrobats tried to burglarize the home of the Garden ants. The Garden ants keep a pile of stones near the door. When the enemy would appear these stones would be rushed to the door and dropped in until the stairway was plugged up.

ALBERT. Yes, and then the enemy would begin to

remove the stones, and it was a tight race. The Acrobats generally won out.

DOROTHY. I now see why that pile of stones is kept by the door.

ALBERT. The Garden ants are much the smaller and can squeeze down the stairway even after it is plugged up. Often they build a pyramid over the door to keep the Acrobats out, but the builders always know where there is a door at which they can enter.

The Year Is Up, and the Ants Are Given a Feast.

KENNETH. I gave our ants a T-bone that had a little meat left on it. You see, the year is up, and I wanted to give them a feast they wouldn't forget. Well, besides the T-bone I gave them some cooked squash and some weak alcohol.

FLORENCE. Meat, squash and poison—something of a feast, I should say.

KENNETH. A large number of ants at once stationed themselves near the bone. They knew the smell of it would bring many enemies, I guess. Then I had to leave.

FLORENCE. Sorry.

KENNETH. Three hours later I again appeared on the scene—nine o'clock at night—with my flashlight. One hundred ants were eating what little meat was left, three hundred guards were stationed over the yard, twenty ants were trying to cover up the bone with dirt, one was eating squash, many were drinking hard, but there was a disturbance on the east side of the bone.

FLORENCE. And what was the matter down on the east side?

KENNETH. About three hundred of our ants down there were formed in a mass, standing side by side about

one-eighth of an inch apart, and facing an old Acrobat nest that was four feet away. In front of our ants were a hundred Acrobats that thought they ought to have been invited to the feast.

DOROTHY. Well, I'm not surprised. Go on.

KENNETH. Our ants had their heads down close to the ground, like fighting roosters. After many a jerk, jump, somersault, dodge, grab, tumble, scrap and shot, the Acrobat jam forced a flying wedge through the ranks of our ants and climbed onto the T-bone.

DOROTHY. Ours were just bluffing, or some of the ants would have been killed. Neither did the Acrobats try to kill ours. That's certain.

KENNETH. I left and came back at ten o'clock, but some poor dog had carried off the bone—ants and all, I suppose.

FLORENCE. I wondered why our ants had the St. Vitus dance this morning. Combination of beef, battle and bottle.

ALBERT. I gave ours some grapes this evening to quiet their nerves, but not an Acrobat stood at the well-filled lunch counter. Always before this they attended all wine suppers given by our ants—uninvited.

FLORENCE. Our ants have moved four times within a year, used four different nests, and lived in one of the houses twice. They moved three months after we first found them, lived in the next house six weeks, and in one only thirty-six hours. We know they have been chased from home twice, and that they have had three battles with the Eyeless Robbers.

ALBERT. Yes, and now a man is building a house by theirs and has covered the nest a foot deep with earth. So the ants have been forced to move the fifth time. They

are now mining a new home forty feet east of the old one, among the fruitful weeds in our last year's bean patch. Come and see.

ANT. Hello, children!

FLORENCE. Well, this is June the first and our year is up. So it's good-bye ants and all the other insects.

DOROTHY. I think of our Harvesters as little people. You know they would let us play with them—weren't afraid.

KENNETH. Look at them now—all working and all minding their own business.

CECIL. And the wisest of all insects.

ANT. Thank you.

Farewell.

ALBERT. Here's to your success and happiness, Ant. Attention! The Bean Gang will come to order for this last meeting and make remarks afterwards. We have spent many pleasant hours with our little friends since July 1st, one year ago. Is there any unfinished business?

FLORENCE. I move that Ant be elected an honorary member of the Bean Gang.

ALBERT. The motion is carried and you are appointed to bring the new member forward. Any farewell speeches?

DOROTHY. I—I——

FLORENCE. I—I—— Loan me your handkerchief.

ANT. I—I—I——

KENNETH. Mr. President, I—I——

CECIL. Mr. President, I move we adjourn "sign a die." I guess that's what they call it.

ALBERT. The motion is carried and the Bean Gang Society is adjourned forever.

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